AMPY

FUNCTIONAL SPECIFICATION

POLY REPORTER WITH MAXIMUM DEMAND

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CUSTOMER SPECIFICATION DOCUMENT

AMPY AUTOMATION LIMITED
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Contents

Contents 2
Introduction 3
  Purpose 3
Definitions 3
  References 3
Meter Overview 3
Operational Requirements 4
  Measurement 4
  Maximum Demand 4
  kW Maximum Demand Register 4
  kVAr Maximum Demand Register 5
  Cumulative kW Maximum Demand Register 5
  Cumulative kVAr Maximum Demand Register 5
  Previous Month kW Maximum Demand 5
  Previous Month kVAr Maximum Demand 5
  Total kWh Register 5
  Total kVArh Register 6
  Total kWh Phase 1 6
  Total kWh Phase 2 6
  Total kWh Phase 3 6
  Previous Month Total kWh Register 7
  Previous Month Total kVArh Register 7
  Rate 1 - 8 kWh Registers 7
  Rate 1 - 8 kVArh Registers 7
  Total Reverse / Export Energy Register 7
  Reverse Energy Indication 8
  Instantaneous Data Readings 8
User Interfaces 8
  Push Button 8
  Optical Interface 8
  Inductive Serial Data Port 8
  Auxiliary Relay 9
  Pulse Output 9
Functional Requirements 9
  General Facilities 9

Introduction

Purpose

This document describes the operation and specification for the Polyphase Credit Meter to be called, “Poly Reporter”.

Definitions

BS : British Standard
IEC: International Electrotechnical Commission
SI : Statutory Instruments
kWh : Kilo Watt Hours
kVArh : Reactive Energy
RTC : Real Time Clock
LCD : Liquid Crystal Display
LED : Light Emitting Diode
HHU : Hand-Held Unit
CMI : Common Modular Interface
mS : Milli-Second
MD : Maximum Demand

References

1. IEC1036 : 1993 :	Alternating current static watt-hour meters for active energy. (classes 1 & 2)
2. BS5685 : 1979 : Part 1 :	Specification class 0.5, 1.0 and 2.0 Single phase and Polyphase, single rate and multi-rate watt-hour meters.
3. IEC1038 : 1993 :	Time switches for tariff and load control.
4. IEC1107 :	Data Exchange for Meter Reading, Tariff and Load Control. Direct Local Exchange.
5. SI 792 :	The Meters (Certification) Regulations 1990;

Meter Overview

The meter is a whole current credit meter, capable of measuring kWh, kVArh and MD, is the type approved to BS EN61036: 1993 class 1.0. The Meter has 3 measuring elements capable of being configured as 3 phase 4 wire, 3 phase 3 wire, 2 wires of 3 phases, 1 wire of 2 phases or single phase of 3 wires. There are 8 kWh registers and 8 kVArh registers controlled by up to 16 time switches using internal RTC. A LCD will display all the meter's data and phase condition.

Operational Requirements

Measurement

The Meter is a 220 / 380 Vac - 240 / 415 Vac per phase, 50 and 60 Hz, 5 - 120 Amp Polyphase Credit Meter. It contains 3 independent measuring elements allowing consumed energy to be measured in up to 4 wires. The meter measures and registers kWh and kVArh to class 1.0. In addition the meter also offers kW and kVAr MD.
There are 2 red LED's mounted on the front panel of the meter, pulsing at a rate of 1,000 pulses per kWh and kVArh measured in all 3 elements for energy registration.

Maximum Demand

The Active and Reactive Power is integrated over a configurable period of 1,2,3,4,5,6,10,12,15,20,30 and 60 minutes and continuously measured monthly with the highest kW and kVAr demand being stored. At the end of each month the Maximum Demand for kW and kVAr will be stored and added to the relevant registers which are explained within this section.

kW Maximum Demand Register

The kW MD for the current month will be stored and displayed to 2 decimal places.

- The kW MD register range is 0000.00 - 9999.99

kVAr Maximum Demand Register

The kVAr MD for the current month will be stored and displayed to 2 decimal places.

- The kVAr MD register range is 0000.00 - 9999.99

Cumulative kW Maximum Demand Register

The Cumulative kW MD will be stored and displayed to 2 decimal places.

- The Cumulative kW MD register range is 0000.00 - 9999.99

Cumulative kVAr Maximum Demand Register

The Cumulative kVAr MD will be stored and displayed to 2 decimal places.

- The Cumulative kVAr MD register range is 0000.00 - 9999.99

Previous Month kW Maximum Demand

The kW MD for the previous month will be stored and displayed to 2 decimal places.

- The Previous Months kW MD register range is 0000.00 - 9999.99

Previous Month kVAr Maximum Demand

The kVAr MD for the previous month will be stored and displayed to 2 decimal places.

- The Previous Months kVAr MD register range is 0000.00 - 9999.99

Total kWh Register

The total kWhs measured are stored internally to 3 decimal places. The total kWhs is displayed on the meter to a maximum of 2 decimal places unless programmed via the Flag Port (see User Interfaces) to 3 decimal places for testing purposes.

- The Total kWh register range is 000000.000 - 999999.999 kWh

Total kVArh Register

The total kVArhs measured are stored internally to 3 decimal places. The total kVArhs is displayed on the meter to a maximum of 2 decimal places unless programmed via the Flag Port (see User Interfaces) to 3 decimal places for testing purposes.

- The Total kVArh register range is 000000.000 - 999999.999 kVArh

Total kWh Phase 1

The total kWhs measured for Phase 1 are stored internally to 3 decimal places. The total kWhs for Phase 1 is displayed on the meter to a maximum of 2 decimal places unless programmed via the Flag Port (see User Interfaces) to 3 decimal places for testing purposes.

- Phase 1 Total kWh register range is 000000.000 - 999999.999 kWh

Total kWh Phase 2

The total kWhs measured for Phase 2 are stored internally to 3 decimal places. The total kWhs for Phase 2 is displayed on the meter to a maximum of 2 decimal places unless programmed via the Flag Port (see User Interfaces) to 3 decimal places for testing purposes.

- Phase 2 Total kWh register range is 000000.000 - 999999.999 kWh

Total kWh Phase 3

The total kWhs measured for Phase 3 are stored internally to 3 decimal places. The total kWhs for Phase 3 is displayed on the meter to a maximum of 2 decimal places unless programmed via the Flag Port (see User Interfaces) to 3 decimal places for testing purposes.

- Phase 3 Total kWh register range is 000000.000 - 999999.999 kWh

Previous Month Total kWh Register

The total kWhs measured for the previous month are stored and displayed to 2 decimal places.

- The Previous Month Total kWh register range is
  000000.000 - 999999.99 kWh

Previous Month Total kVArh Register

The total kVArhs measured for the previous month are stored and displayed to 2 decimal places.

- The Previous Month Total kVArh register range is
  000000.000 - 999999.99 kVArh

Rate 1 - 8 kWh Registers

The energy measured at any particular rate is stored internally to 3 decimal places, but only displayed to a maximum of 2 decimal places.

- The Rate kWh register range is 000000.000 - 999999.999 kWh

Rate 1 - 8 kVArh Registers

The energy measured at any particular rate is stored internally to 3 decimal places, but only displayed to a maximum of 2 decimal places.

- The Rate kVArh register range is 000000.000 - 999999.999 kVArh

Total Reverse / Export Energy Register

The reverse / export kWh consumed by the meter is stored internally to 3 decimal places, but only displayed to a maximum of 2 decimal places.

- The Reverse kWh register range is 000000.000 - 999999.999 kWh

Reverse Energy Indication

If reverse energy is detected, the display alternates between a Reverse Energy Detected message and the default displays.

Note: The meter is configured to have either an Export Energy Register or Reverse Energy Register. The Reverse Energy Indication can only be selected if the Reverse Energy Register is selected

Instantaneous Data Readings

The meter measures and displays the following data, which is updated every minute.

- Per Phase (voltage to current) angle.
- Overall Power Factor:
    - 0.5 to 1.0 Lagging
    - 0.5 to 1.0 Leading

User Interfaces

Push Button

A front panel Push Button is provided allowing the user to view a pre-configured display cycle.

Optical Interface

The meter has a FLAG optical interface based upon the IEC 1107 protocol.

If the meter is to be programmed using a third party HHU, the HHU will possibly require modification to work with the meter. This is because the meter uses a masked processor.

Inductive Serial Data Port

The meter incorporates an Inductive Serial Data Port which will transmit all the information within the meter through the meter case. The data transmitted is generally in accordance with the CMI specification and can be received by any module fitted with a suitable receiver placed adjacent to the transmitter outside the case. (there is no physical connection)

Auxiliary Relay

The meter has two pairs of voltage free connections for controlling secondary circuits such as central heating.
The current rating of the connections is 2 amps which must not be exceeded.

Pulse Output

The meter incorporates 2 voltage free pulse outputs, the first for kWh and the second for kVArh, utilising 4 auxiliary terminals in the meter terminal block. The pulse outputs are configurable to have from 1 to 1000 pulses per kWh in 1 pulse steps, with a pulse duration of 20 to 500 mS in 20 mS steps.

NOTE: The meter can have 2 pulse outputs, 2 pairs of voltage free connections or one of each.

Functional Requirements

General Facilities

The default display is always the Active Rate. When the meter is operating normally, pressing the push button allows various pre-configured parameters to be displayed. A pre-set option determines whether the display automatically cycles through all the parameters or waits for the display button to be pressed between each parameter. If during a manual advancing cycle the display button is not pressed within 30 seconds, the meter will revert to the default display.

AMPY

FUNCTIONAL SPECIFICATION

POLY REPORTER

TYPE: 5165

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CUSTOMER SPECIFICATION DOCUMENT

AMPY AUTOMATION LIMITED
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Contents

Contents 2
Introduction 3
  Purpose 3
Definitions 3
  References 3
Meter Overview 4
Operational Requirements 4
  Measurement 4
  Total kWh Register 4
  Total kVArh Register 4
  Rate 1 - 8 kWh Registers 5
  Rate 1 - 8 kVArh Registers 5
  Reverse / Export Energy Register 5
  Reverse Energy Indication 5
User Interfaces 6
  Push Button 6
  Optical Interface 6
  Inductive Serial Data Port 6
  Auxiliary Relay 6
  Pulse Output 6
Functional Requirements 7
  General Facilities 7

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SI : Statutory Instruments
kWh : Kilo Watt Hours
kVArh : Reactive Energy per Hour
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LCD : Liquid Crystal Display
LED : Light Emitting Diode
HHU : Hand-Held Unit
CMI : Common Modular Interface
mS : Milli-Second

References

1. IEC1036 : 1996 :	Alternating current static watt-hour meters for active energy. (classes 1 & 2)
2. IEC1268 : 1996:	Alternating current static var-hour meters for reactive energy (classes 2 & 3)
3. BS5685 : 1979 : Part 1 :	Specification class 0.5, 1.0 and 2.0 Single phase and Polyphase, single rate and multi-rate watt-hour meters.
4. IEC1038 : 1993 :	Time switches for tariff and load control.
5. IEC1107 :	Data Exchange for Meter Reading, Tariff and Load Control. Direct Local Exchange.
6. SI1566 : 1998 :	The Meters (Certification) Regulations 1998;

Meter Overview

The meter is a whole current credit meter, capable of measuring kWh and kVAr and is the type approved to IEC1036: 1996 class 1.0 for kWh and IEC1268: 1996 class 2.0 for kVArh. The Meter has 3 measuring elements capable of being configured as 3 phase 4 wire, 3 phase 3 wire, 2 wires of 3 phases, 1 wire of 2 phases or single phase of 3 wires. There are 8 kWh registers and 8 kVArh registers controlled by up to 16 time switches using internal RTC. A LCD will display all the meter's data and phase condition.

Operational Requirements

Measurement

The Meter is a 220 / 380 Vac - 240 / 415 Vac per phase, 50 and 60 Hz, 5 - 120 Amp Polyphase Credit Meter. It contains 3 independent measuring elements allowing consumed energy to be measured in up to 4 wires. The meter measures and registers kWh to class 1.0 accuracy and kVArh to class 2.0 accuracy. There are 2 red LED's mounted on the front panel of the meter, pulsing at a rate of 1,000 pulses per kWh and kVArh measured in all 3 elements for energy registration.

Total kWh Register

The total kWhs measured are stored internally to 3 decimal places. The total kWhs is displayed on the meter to a maximum of 2 decimal places unless programmed via the Flag Port (see User Interfaces) to 3 decimal places for testing purposes.

- The Total kWh register range is 000000.000 - 999999.999 kWh

Total kVArh Register

The total kVArhs measured are stored internally to 3 decimal places. The total kVArhs is displayed on the meter to a maximum of 2 decimal places unless programmed via the Flag Port (see User Interfaces) to 3 decimal places for testing purposes.

- The Total kVArh register range is 000000.000 - 999999.999 kVArh

Rate 1 - 8 kWh Registers

The energy measured at any particular rate is stored internally to 3 decimal places, but only displayed to a maximum of 2 decimal places.

- The Rate kWh register range is 000000.000 - 999999.999 kWh

Rate 1 - 8 kVArh Registers

The energy measured at any particular rate is stored internally to 3 decimal places, but only displayed to a maximum of 2 decimal places.

- The Rate kVArh register range is 000000.000 - 999999.999 kVArh

Reverse / Export Energy Register

The reverse / export kWh consumed by the meter is stored internally to 3 decimal places, but only displayed to a maximum of 2 decimal places.

- The Reverse kWh register range is 000000.000 - 999999.999 kWh

Reverse Energy Indication

If reverse energy is detected, the display alternates between a Reverse Energy Detected message and the default displays.

Note: The meter is configured to have either an Export Energy Register or Reverse Energy Register. The Reverse Energy Indication can only be selected if the Reverse Energy Register is selected

User Interfaces

Push Button

A front panel Push Button is provided allowing the user to view a pre-configured display cycle.

Optical Interface

The meter has a FLAG optical interface based upon the IEC 1107 protocol.

If the meter is to be programmed using a third party HHU, the HHU will possibly require modification to work with the meter. This is because the meter uses a masked processor.

Inductive Serial Data Port

The meter incorporates an Inductive Serial Data Port which will transmit all the information within the meter through the meter case. The data transmitted is generally in accordance with the CMI specification and can be received by any module fitted with a suitable receiver placed adjacent to the transmitter outside the case. (there is no physical connection)

Auxiliary Relay

The meter has two pairs of voltage free connections for controlling secondary circuits such as central heating.
The current rating of the connections is 2 amps which must not be exceeded.

Pulse Output

The meter incorporates 2 voltage free pulse outputs, the first for kWh and the second for kVArh, utilising 4 auxiliary terminals in the meter terminal block. The pulse outputs are configurable to have from 1 to 1000 pulses per kWh and kVArh in 1 pulse steps, with a pulse duration of 20 to 500 mS in 20 mS steps.

NOTE: The meter can have 2 pulse outputs, 2 pairs of voltage free connections or one of each.

Functional Requirements

General Facilities

The default display is always the Total kWH + active rate. When the meter is operating normally, pressing the push button allows various pre-configured parameters to be displayed. A pre-set option determines whether the display automatically cycles through all the parameters or waits for the display button to be pressed between each parameter. If during a manual advancing cycle the display button is not pressed within 30 seconds, the meter will revert to the default display.

The table below lists the User Displays that are activated by pressing the display button:

DISPLAYS	REMARKS	KEY
DISPLAY TEST ******************	Test all character positions on the display	
Time HH:MM	Current Time in 24 hour mode	HH - hours MM - minutes
Day DD/MM/YYYY	Current Date	Day = Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday DD = Date MM = Month YYYY = Year
kWh XXXXXX TOT	Total kWh (0dp)	
kWh XXXXXX.XX TOT	Total kWh (2dp)	
kWh XXXXXX RY	kWh for rates 1 to 8 (0dp)	RY = rate number from 1 to 8
kWh XXXXXX.XX RY	kWh for rates 1 to 8 (2dp)	RY = rate number from 1 to 8
kVArh XXXXXX TOT	Total kVArh (0dp)	
kVArh XXXXXX.XX TOT	Total kVArh (2dp)	
kVArh XXXXXX RY	kVArh for rates 1 to 8 (0dp)	RY = rate number from 1 to 8
kVArh XXXXXX.XX RY	kVArh for rates 1 to 8 (2dp)	RY = rate number from 1 to 8
REV kWh XXXXXX.XX TOT	Total kWh measured in reverse	
R.E.D	Reverse Energy Detected	
RQ XX YY	Displayed for up to 16 time switches	HH:MM=switch time RW=switch rate XX=season switch YY=Day Description
SUMMER AT DD MM WINTER AT DD MM	Summer time start Winter time start	DD,MM=day,month

NOTE: Some parameters may not be displayed if not applicable, e.g. rate 4 would not be displayed if the meter were configured for only 3 rates.

Win Flag User Notes - Additional Notes

To install Winflag, Run A: Setup.Exe from Windows program manager. Set up Icon as required. (Installation consist of 2 Diskettes)

When first using Winflag, no user names or passwords exist. Cancel the log-on message to enter the main program. Select security and Add User by following the *add user* notes under *security*.

Security

Add User

To add a user, select add user from the security menu and enter the requested details. **Note:** Supervisor password is **PWSV**

For other information refer to the User Manual

Win Flag User Notes

To install Winflag, Run A:Setup from Windows program manager.
Set up Icon as required.

When first using Winflag, no user names or passwords exist. Cancel the log-on message to enter the main program. Select security and Add User by following the *add user* notes under *security*.

Security

Add User

To add a user, select add user from the security menu and enter the requested details. **Note :** Supervisor password is **PWSV** Security levels :
Level One will allow the user to upload data from the meter only.
Level Two. The user will be allowed to upload data, update time and clear the reverse energy message.
Supervisor level will allow full functionality of the package.

Log On

Before use of the package, the user must log on with a valid user name and password.

Settings

The settings menu allow the required communications port and flag password to be selected. For Eastern Electricity 5077E meters this is **BCSC. (Otherwise "SALE")**

Communications

The following actions can be performed by selecting the Communications heading:

Time update

The time display in the 5077E meter can be updated by selecting this function. The time downloaded to the meter will the same as that set in the PC.

Clear reverse

When a meter detects reverse energy the 'rEd' message will be shown on the display. To clear this message select this function.

Upload data

Data can be extracted from the meter be selecting the upload data function.
Data extracted will depend on configuration and number of rates selected.

Configure Meter

On single rate 5077A/B meters, the number of decimal places can be altered by selecting the meter model then the required number of decimal places. Enter a scheme ID and save file before selecting *Configure Meter*.

Multi-rate versions 5077E/D have the option of display sequence configuration. To alter the sequence select the meter model. A list of available displays are shown in the select display box. Double clicking on the required display will make an entry in the meter display box. This will be the sequence configured to the meter. Number of rates, decimal places can also be selected as above.

Time switches for 5077E meter can be created by selecting *set time switches*. Enter time, required rate number and required days for each switch. Switches can be deleted by double clicking the entry.

Note : Before configuring a meter, a scheme ID must be entered, and the configuration saved. The scheme ID can be any two alphanumeric characters.

5165 Polyphase Meter Configuration Utility

User Manual

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1. 5165 POLYPHASE METER CONFIGURATION UTILITY 3

2. METER VERSION 3

3. SOFTWARE INSTALLATION 3

4. RECOMMENDED SYSTEM REQUIREMENTS 3

5. SECURITY 4
- 5.1. ADDING A USER 4
- 5.2. CURRENT USER 5

6. FILE OPERATIONS 5
- 6.1. FILE - OPEN 5
- 6.2. FILE - NEW 6
- 6.3. FILE - SAVE / SAVE AS 6

7. SETTINGS - FLAG 6

8. CONFIGURABLE METER OPTIONS 7
- 8.1. HARDWARE VARIANTS 7
  - *8.1.1. Single Rate Meters* 7
  - *8.1.2. Multiple Rate Meters* 7
- 8.2. METER DISPLAY OPTIONS 8
  - *8.2.1. Display Cycle / Default Display* 8
  - *8.2.2. Display Resolution* 9
- 8.3. REVERSE ENERGY OPTIONS 9
- 8.4. PULSE OUTPUT FUNCTIONS 10
- 8.5. TIME SWITCHES AND TIME 11
- 8.6. MAXIMUM DEMAND 12

9. COMMUNICATIONS 13
- 9.1. CONFIGURE METER 13
- 9.2. TIME UPDATE 13
- 9.3. CLEAR REVERSE 13
- 9.4. SHOW 3 DP 13

1. 5165 Polyphase Meter Configuration Utility

The 5165 family of meters are feature rich and fully configurable through the industry standard Flag interface. This utility allows the user to generate, save and program personalised profiles for each meter in the family. Each profile is saved with a Scheme ID so that the profile within a meter may be easily recognised.

The utility provides different levels of functionality based on three levels of user privilege. New users may be added by whoever administers the software. When the utility is started a user and associated password are requested. If a valid user is not entered the application begins but offers no functionality.

2. Meter Version

When a 5165 meter is powered up it displays its hardware version, software version and functionality level for a short period of time. The display is in the format:

"AMPY F40E"

where the 'F' represent the hardware variant, '40' represents the functionality level and 'E' represents the software version. This information identifies the meter and is essential in assisting Ampy with any technical enquiries.

3. Software Installation

The utility is suitable for all versions of Microsoft Windows, the installation comprises 16bit and 32bit versions.

16bit - Windows 3.x
32bit - Windows 9x, NT

4. Recommended System Requirements

Pentium Processor
5Mb Free Hard Disc
8Mb RAM
VGA / SVGA Monitor
Serial Communication Port

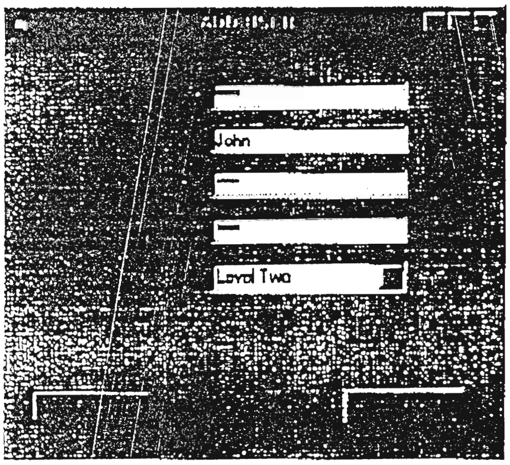
5. Security

This section tables the menu options permitted at each privilege level, the options themselves are described in the remainder of this guide.

Menu Option	Minimum Privilege Level
Add User	Level Zero (Default)
Log On	Level Zero (Default)
Log Off	Level Zero (Default)
Open File	Level One
Clear Reverse	Level Two
Show 3 dp	Level Two
Configure Meter	Level Two
Time Update	Level Two
Flag Settings	Level Two
New File	Supervisor
Save File	Supervisor
Save File As	Supervisor

5.1. Adding a User

New users may be added at any point by the system administrator. The new user may then log on to the utility and perform those tasks permitted his security level. The screen below shows a user John being added to the system with Level Two security privileges.



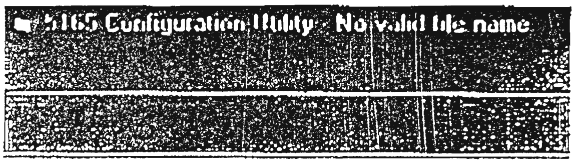
John

Level Two

The administrator is required to know the Supervisor Password (available from Ampy).

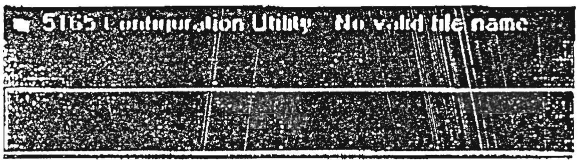
5.2. *Current User*

A valid user may log on simply by entering his user name and password. Following a successful log on the utility will display the user name and security level in the top left area of the screen.



5165 Configuration Utility - No valid file name

If the user logs off or the utility is started without a valid log on the utility indicates that no user has been validated and all functionality is disabled.



5165 Configuration Utility - No valid file name

6. File Operations

Configuration profiles must be saved to file before they may be programmed into a meter. Files used by the configuration utility can be recognised by their extension "pfg".

6.1. *File - Open*

Previously saved files may be read back into the utility in order to configure meters or simply to verify settings. Each file has an associated Scheme ID so that profiles can easily be recognised. It is the duty of the user to assign the Scheme ID, it is advisable to keep the Scheme ID unique to a file.

6.2. File - New

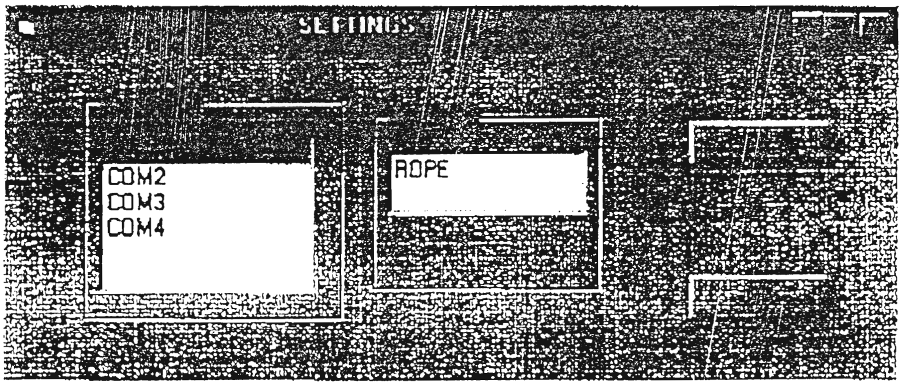
A fresh profile can be generated with this menu option. The new profile may not be used until it is saved to file. The utility will default to hardware variant 'A' when a new file is requested, the required hardware variant must be selected before the appropriate configurable settings become enabled.

6.3. File - Save / Save As

When a profile has been entered correctly it may be saved to file. If a previous profile has been edited the Save option will update the profile under the previous file name. If a new file name is required following edits to an existing profile or no valid file name exists then the Save As option should be used to specify a file name. No profile may be saved without a valid Scheme ID.

7. Settings - Flag

An unused serial communications port must be selected for the Flag probe if a meter is to be configured. In addition a four character alpha password must be entered. This password is required for Flag security purposes and will be made available by Ampy.

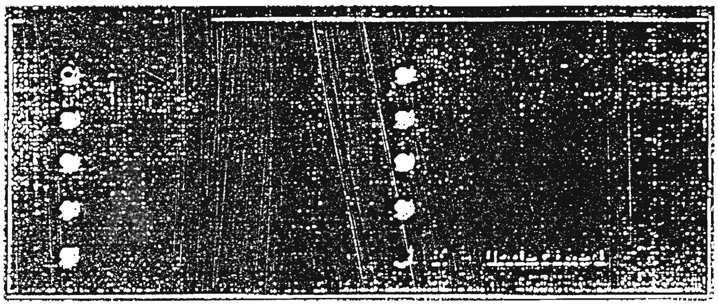


COM2
COM3
COM4

ROPE

8. Configurable Meter Options

When creating a configuration profile the first decision is the choice of meter version. The 5165 family provide a wide range of functionality but many options are only available on certain variants. The button for the desired meter must be highlighted; in the example below the 'A' version has been selected.



8.1. *Hardware Variants*

All meters have configurable reverse energy options and a choice of display resolution.

8.1.1. Single Rate Meters

Meter versions 'A' and 'B' are single rate meters with no display cycle. Meter version 'B' can generate pulses outputs for both kWh and kVArh consumption.

8.1.2. Multiple Rate Meters

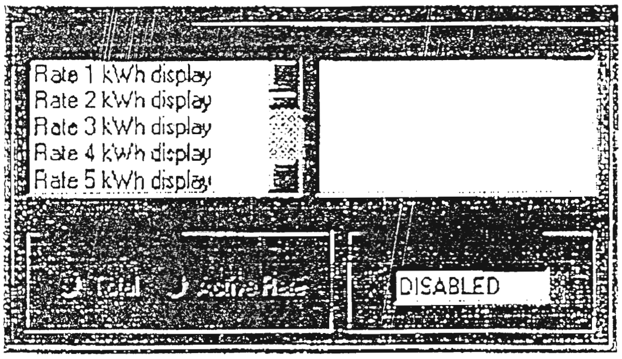
Meter versions 'C' through 'J' may be configured with up to 8 rates, contain time and date information, internal time-switches and a configurable display cycle.

Meter Hardware Version	Additional Functionality
'C'	Standard version
'D'	kWh and kVArh pulse output
'E'	Two auxiliary relays
'F'	kWh pulse output and a single auxiliary relay
'G'	kVArh pulse output and a single auxiliary relay
'H'	kWh pulse output
'J'	kWh pulse output and a single auxiliary relay with maximum demand options

8.2. *Meter Display Options*

8.2.1. Display Cycle / Default Display

Multiple rate meters have a configurable display cycle and a choice of two default displays.



Rate 1 kWh display
Rate 2 kWh display
Rate 3 kWh display
Rate 4 kWh display
Rate 5 kWh display

DISABLED

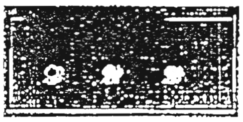
Displays may be added to the meters display list by double clicking entries from the left hand list. The selected entries are shown in the right hand list. Entries may be removed from the right hand list by double clicking on the unwanted display legend.

The meter may be configured to automatically cycle through the selected display list by entering a time from 0 to 15 into 'Auto-Cycle Time'. The value gives the time in seconds between moving from one display to the next. A value of zero disables auto-cycling.

The default display may either show the total kWh consumption measured by the meter by selecting 'Total' or the value held in the active kWh rate register by selecting 'Active Rate'. If auto-cycling is enabled there is effectively no default display.

8.2.2. Display Resolution

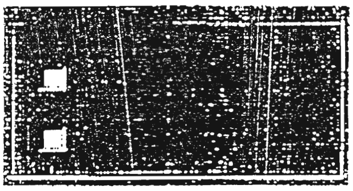
All meter versions may display consumption information to a resolution of 0, 1, 2 or 3 decimal places.



Note. For meters with major software revision 'G' or later configuring the meter to 3 decimal places has only a temporary effect and will revert to the previous setting following a power-down / power-up cycle.

8.3. *Reverse Energy Options*

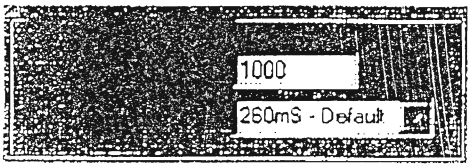
If the passage of reverse energy is detected the meter may give a visual indication by displaying the reverse energy legend if the 'Display Red Message' option is checked.



The reverse energy may be stored in a special register as it is consumed if the 'Store Reverse kWh' option is checked.

8.4. Pulse Output Functions

The pulse output parameters specify the length and frequency of the output pulses. The parameters are common to kWh and kVArh pulse generation. Pulses are derived from the combined energy consumed over all measured phases. The pulses may be captured by some external device which may profile or accumulate the total energy measured by the meter.



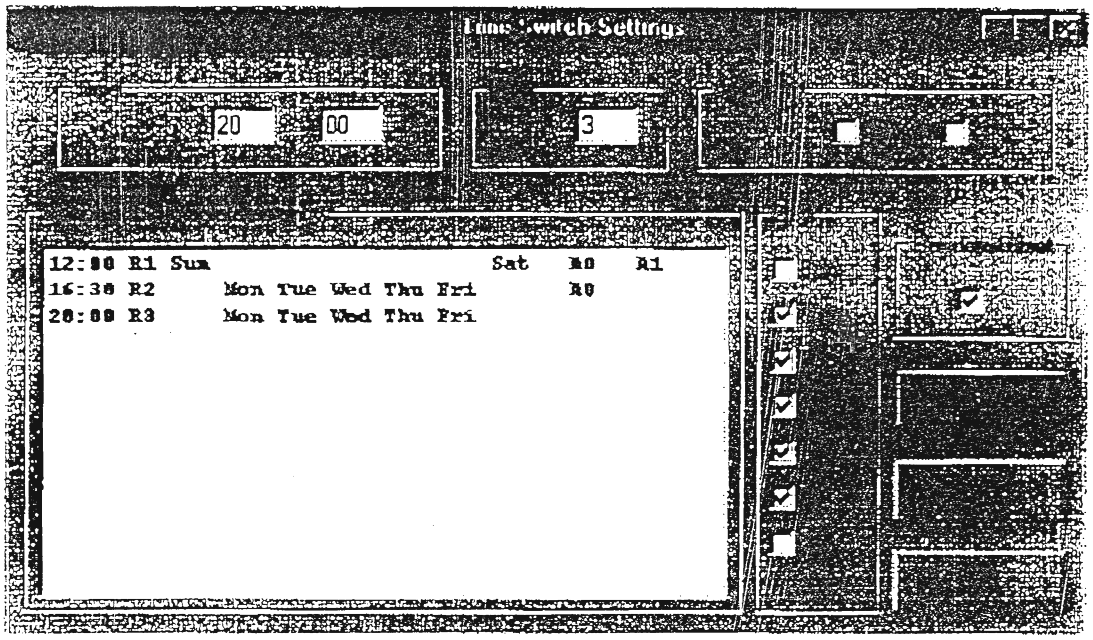
1000

260mS - Default

Pulses per unit represent the number of Wh's that must be registered by the meter before a pulse is generated. In the example above a single pulse is generated every kWh. Pulse duration is the length of the pulse and can be selected in 20ms intervals only.

8.5. Time Switches and Time

Multiple rate meters store and maintain the current time and date, all multiple rate versions may be set to automatically adjust for daylight saving. Multiple rate meters use the time and date to select the current active rate and to control auxiliary relays through time switch settings. Time switches are entered in the screen depicted below, a few example switches have been shown.



```
12:00 R1 Sun                          Sat   R0   R1
16:30 R2     Mon Tue Wed Thu Fri            R0
20:00 R3     Mon Tue Wed Thu Fri
```

The first point to note is that the 'Enable Random Offset' option has been checked. The random offset provides a soft start for each time switch. With this option a time switch will not become active for a random period of up to 15 minutes following the specified start time.

As new time switches are entered the utility automatically sorts the time switches into ascending time order. Each switch has a start time and is only valid for those specified days of the week. For example, the first time switch is only active at weekends whereas the other two time switches are used only during week days.

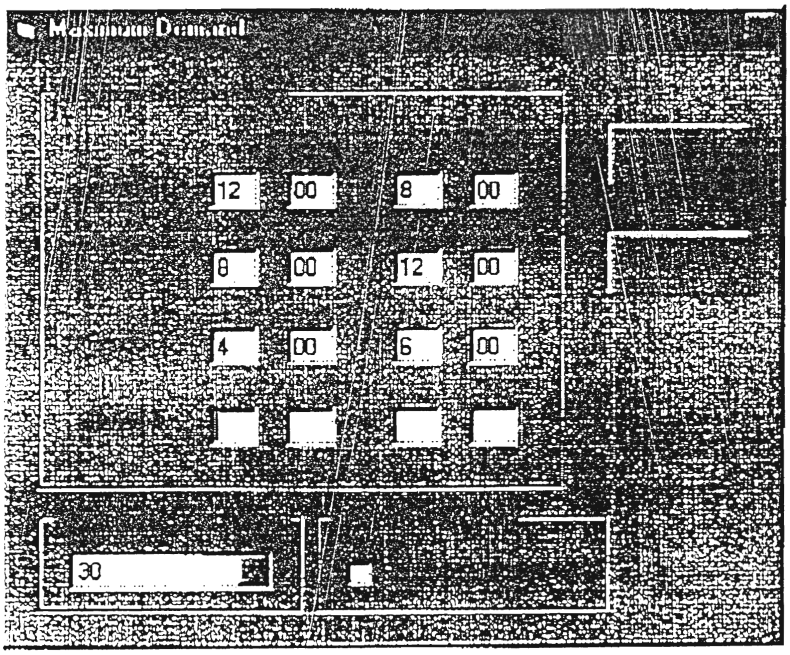
Each time switch has an associated rate which becomes the meters active rate when a time switch becomes current. Only rates found within the time switches can ever become the active rate. Therefore an 8 rate meter may be limited to 4 rates by the use of the time switches.

If the meter has auxiliary relays these may be controlled using the time switches. The first time switch will close both auxiliary relays, the second time switch will open auxiliary relay A1 and the final time switch will open both auxiliary relays.

8.6. *Maximum Demand*

Meter hardware variant 'J' includes maximum demand functionality. The meter is factory configurable to calculate maximum demand values based upon active or reactive power consumption. The power can be integrated over a configurable period of 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30 or 60 minutes to give a kW of kVAr demand for the period.

If the 'Pulse Auxiliary Relay' option is selected a 4s pulse is generated at the end of each demand period. The pulse may be used by other equipment for synchronisation purposes. If this option is selected normal auxiliary relay operation (in regard to time switch settings) is disabled.



12 00 8 00

8 00 12 00

4 00 6 00

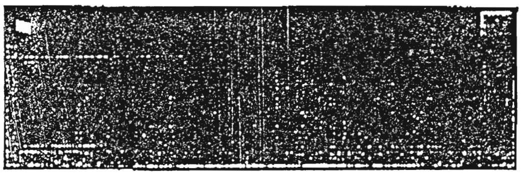
30

There is a main maximum demand register that is continually operational and 4 demand registers that may be set to operate within prescribed periods. Three completed periods are shown in the example with Period 1 spanning midnight. Period 4 is undefined and is effectively disabled.

The prescribed hours are useful for determining the maximum demand values for specified portions of the day.

9. Communications

Prior to attempting to communicate with the meter check that the Flag probe is in the correct serial communications port and that the correct information has been entered in the Flag settings screen. Ensure that the meter variant selected for the profile is correct for the meter. Once the command is underway the progress is displayed on a 'fuel gauge'.



9.1. Configure Meter

When a profile has been successfully created it may be downloaded into a meter via the Flag probe. The total time taken to configure the meter depends on the meter variant as well as the number of entries in the display cycle and the number of time switches.

9.2. Time Update

Multiple rate meters store and maintain time and date information. The factory set time and date may not be correct and can be updated using this option. The time and date is taken from the utility host PC and transferred to the meter.

9.3. Clear Reverse

When reverse energy is registered it is optionally stored in a special register and the reverse energy legend will toggle with the default display. The special register and reverse energy legend can be cleared with this operation.

9.4. Show 3 dp

The meter can be temporarily configured to display 3 decimal places for testing purposes. Following a power-down the meter will revert to its previous number of decimal places.

AMPY	**POLYPHASE CREDIT METER** **Meter Configuration Sheet** **(5165)**	DATE: 18/9/98 ISSUE: 1 PAGE: 1 OF 4

1. Option Summary

This document has been raised for customers to summarise their required options and settings and should be read in conjunction with the Functional Specification.

Please return the completed document to AMPY for our manufacturing specification, retaining a photocopy for your records.

FOR CUSTOMER USE	CUSTOMER:	
	CUSTOMER REF/ORDER NO:	
	COMPLETED BY:	
	SIGNATURE:	
	DATE:	

FOR AMPY USE ONLY	AMPY Filename:	
	AMPY Scheme ID:	
	FLAG Password: (if required to be different)	
	ALLOCATED BY:	
	SIGNATURE:	
	DATE:	

1. Meter Selection

Select the required meter and complete the following sections as shown

Meter type	**Description**	**Sections to be completed**
5165A	Single rate, no outputs	section 3
5165B	Single rate, kWh and KVArh dual pulse output	sections 3 and 4
5165C	Multi-rate, no outputs	sections 3, 5 and 6
5165D	Multi-rate, kWh and KVArh dual pulse output	sections 3, 4, 5 and 6
5165E	Multi-rate, dual auxiliary relay	sections 3, 5 and 6
5165F	Multi-rate, kWh pulse output and auxiliary relay	sections 3, 4, 5 and 6
5165G	Multi-rate, kVArh pulse output and auxiliary relay	sections 3, 4, 5 and 6
5165H	Multi-rate, kWh pulse output	sections 3, 4, 5 and 6

AMPY	POLYPHASE CREDIT METER Meter Configuration Sheet (5165)	DATE: 18/9/98 ISSUE: 1 PAGE: 2 OF 4

3 General

3.1 *Specify required current range.*

	Tick required option
5 to 120 Amp	
10 to 120 Amp	
20 to 120 Amp	

3.2 *Specify Reverse Detection.*

	Tick required option
Disabled	
Enabled, Register only	
Enabled, Register and RED display	

3.3 *Specify Property Details.*

	Enter Details ensuring correct Case.
Property Of	
Supplied By	

3.4 *Specify Bar Coding on Labels.*

	Tick required option
Yes	
No	

3.5 Specify Display Cycle Advance.

	Tick required option
Push-Button	
Automatic	

3.6 *Specify Number of Decimal Places.*

	Tick required option
None	
One	
Two	

3.7 *Specify Reference Voltage.*

	Tick required option
220 / 380 Vac	
230 / 400 Vac	
240 / 415 Vac	

3.8 *Specify Number of Active Rates*

	Enter Number from 1 to 8
Number of Rates	

3.9 *Specify Auxiliary Terminal Bungs*

	Tick required option
None	
Top Two	
Bottom Two	
All Four	

4 Pulse Output

4.1 *Specify Number of Pulses*

*Note:*Value must be divisible by 1000

	Enter Value from 1 to 1000
Pulses per kWh & KVArh	

4.2 *Specify Pulse Duration*

	Enter Value from 20mS to 500mS (in 20mS steps)
Pulse Duration	

AMPY	POLYPHASE CREDIT METER Meter Configuration Sheet (5165)	DATE: 18/9/98 ISSUE: 1 PAGE: 3 OF 4

5 Time Switches

5.1 *Time Switch Setting Table*

Switch Number	Time	Rate	Mon	Tues	Wed	Thur	Fri	Sat	Sun	State Aux Relay 1	State of Aux Relay 2
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											

5.2 *Summer time switching*

	Tick required option
Disable	
Enable	

5.3 *Random Offset on rate switching*

	Tick required option
Disable	
Enable	

AMPY	POLYPHASE CREDIT METER Meter Configuration Sheet (5165)	DATE: 18/9/98 ISSUE: 1 PAGE: 4 OF 4

6 Display Cycle

6.1 Display cycle display selection

Display Messages Available	Numerical position in display cycle
Rate 1 kWh Display	
Rate 2 kWh Display	
Rate 3 kWh Display	
Rate 4 kWh Display	
Rate 5 kWh Display	
Rate 6 kWh Display	
Rate 7 kWh Display	
Rate 8 kWh Display	
Total kWh Display	
Rate 1 kVArh Display	
Rate 2 kVArh Display	
Rate 3 kVArh Display	
Rate 4 kVArh Display	
Rate 5 kVArh Display	
Rate 6 kVArh Display	
Rate 7 kVArh Display	
Rate 8 kVArh Display	
Total kVArh Display	
Display Time	
Display Date	
Display Test	
Reverse Energy kWh Display	

Note : Active rate always shown on normal operating display

TNBM 062000

WHOLE CURRENT POLYPHASE ELECTRONIC METERS

CERTIFICATES

offer
OFFICE OF
ELECTRICITY
REGULATION

ELECTRICITY ACT 1989

APPROVAL OF METERS

The Director General of Electricity Supply hereby approves for the purpose of paragraph 2 of Schedule 7 to the Electricity Act 1989 :-

Manufacturer:	Ampy Automation Digilog Ltd
Type of meter:	5165
Accuracy Class(es):	Class 1 and Class 2 for : Active Energy (kwh) Class 2 and Class 3 for : Reactive Energy (kvarh)
Description of meter:	Direct connected static meter for Active and Reactive energy.

for the measurement of electrical energy where that energy is supplied at the reference frequency of 50Hz and at any reference voltage and reference alternating current on any circuit as specified below:-

Type of Circuit	Size of Meter (amperes)	Reference Voltage
Three Phase Four Wire Two Phase of Three Phase Four Wire Two Single Phase Two Wire Summation Single Phase Three Wire Single Phase Two Wire	5 - 120 10 - 120 20 - 120	220 - 240

As respects the design and the manner of fixing and connecting any such meter with a service line, any method described in the specifications and drawing deposited by the manufacturer with the Office of Electricity Regulation.

Approved in accordance with: EN 61036:1996 EN 61268:1996

Authorised by the Director General of Electricity Supply

Dated: 17 July 1998

Certificate Number: 896

AMPY

Certificate of Year 2000 Compliance.

We are currently conducting a review of our business systems which are software critical and we confirm that we are satisfied that to the best of our knowledge there are no outstanding non-compliances. We do not, therefore, anticipate any interruption in the continuity of our business activities arising from the above on the occasion of Millennium changeover or other critical dates.

Further, we have tested our range of Polyphase Credit Meters, type 5165 and are satisfied that they are millennium compliant in accordance with the Definition of Year 2000 Conformity Requirements, DISC PD2000-1.

We can, however, accept no responsibility in this respect particularly when our systems or products are used with other systems, products or data.

R. H. King. Date. 8/7/99
Process Improvement Manager.

AMPY AUTOMATION - DIGILOG LIMITED
Frognall, Deeping St. James Peterborough, PE6 8SE, England

offer
OFFICE OF ELECTRICITY REGULATION

Your Ref: Offer #10/5165
Our Ref: T/166/279/119

Mr S Bright
Ampy Automation Digilog Ltd
Frognall
Deeping St James
Peterborough
PE6 8RS

Dear Mr Bright

ELECTRICITY ACT 1989

APPROVAL OF NEW METER TYPE 5165

I enclose the Director General of Electricity Supply's approval of the construction and pattern of the above meter.

The meters described above have been given a certification life of 10 years.

Yours sincerely

Mrs P Bloor
Technical Section

RECEIVED
23 JUL 1999
[illegible]
WATERLOO

DATE 1/2/99 | UNCONTROLLED COPY | SIG.

offer
OFFICE OF
ELECTRICITY
REGULATION

APPROVAL REPORT FOR THE PATTERN AND CONSTRUCTION OF ELECTRICITY METERS

MANUFACTURER : *AMPY AUTOMATION*

TYPE : *5165*

CLASS : *1 & 2 Active Energy kWh*
2 & 3 Reactive Energy kvarh

DESCRIPTION : *ELECTRONIC MULTI FUNCTION WATTHOUR METER*

Tested in accordance with EN 61036 *(1996)*, Alternating current static watt-hour meters for active energy (class 1 & 2).

and

EN 61268 *(1996)*, Alternating current static var-hour meters for reactive energy (class 2 & 3).

The meters tested satisfied the required specification.

ISSUED BY: B Johnson

CHECKED BY: M Bloor

OFFICE OF ELECTRICITY REGULATION APPROVAL Nos. 896

APPROVAL DATE: 17th July 1998

File Reference No. T/166/279/119
Action No.317

CONTENTS

INTRODUCTION

INFORMATION OF THE ELECTRICITY METER TESTED

SUPPORTING DOCUMENTATION

1 INSULATION
1.1 Impulse Voltage Test
1.2 AC Voltage Test

2 ACCURACY REQUIREMENTS
2.1 Meter Constant
2.2 Starting Conditions
2.3 Running with no load
2.4 Influence of ambient temperature
2.5 Influence Quantities -
2.5.1 Current Variation
2.5.2 Voltage Variation
2.5.3 Frequency Variation
2.5.4 Waveform : 10% 3rd Harmonic in current circuits
2.5.5 Reverse Phase Sequence
2.5.6 Voltage Unbalance
2.5.7 Continuous Magnetic Induction
2.5.8 Magnetic Induction of 0.5mT
2.6 Accuracy test in the Presence of Harmonics
2.6.1 Harmonic Components in the Current and Voltage Circuits
2.6.2 Influence of Odd and Sub Harmonics in the AC Current Circuit

3 ELECTRICAL REQUIREMENTS
3.1 Power Consumption
3.2 Influence of Supply Voltage - Interruptions and Dips.
3.3 Influence of Short-Time Over-currents
3.4 Influence of Self Heating
3.5 Influence of Heating

4 ELECTROMAGNETIC COMPATIBILITY (EMC)
4.1 Radio Interference Measurement
4.2 Fast Transient Burst Test
4.3 Immunity to Electromagnetic HF Fields
4.4 Immunity to Electrostatic Discharges

5 CLIMATIC INFLUENCES
5.1 Dry Heat Test
5.2 Cold Test
5.3 Damp Heat Cyclic Test
5.4 Solar Radiation

6 MECHANICAL REQUIREMENTS
6.1 Vibration
6.2 Shock
6.3 Spring Hammer
6.4 Penetration of Dust & Water
6.5 Resistance to Heat & Fire

ANNEX (pages 16)

Susceptibility Test Results, HF Electromagnetic Radiation

INTRODUCTION

The type tests described were carried out in the measurement laboratory of the Office of Electricity Regulation (OFFER), on behalf of :

CLIENT DETAILS:
AMPY AUTOMATION DIGILOG LTD
FROGNALL
DEEPING ST JAMES
PETERBOROUGH
PE6 8SE

ORDER No: 26892

APPLICATION RECEIVED DATE: 8th April 1998

In the cases where no or only limited tests have been conducted on the submitted samples, tests carried out during previous OFFER approval (or by other accredited bodies) on meters of similar construction and design have been taken to confirm that the meter satisfies the requirements of the relevant standard. See supporting documentation for reference.

Conditions under which the type tests took place:

The meters were examined at an ambient temperature of 22°C ± 2°C, and after the voltage circuits had been connected to reference voltage for at least 1 hour.

Unless otherwise stated, Polyphase tests were tested with a standard phase sequence of L1-L2-L3 (corresponding to the Red, Yellow & Blue phases).

The tests were conducted using equipment, traceable to National and International Standards.

INFORMATION ON THE ELECTRICITY METERS TESTED

Manufacturer	:	*AMPY AUTOMATION*
Type	:	*5165*
Class	:	*1 & 2 kWh* *2 & 3 kvarh*
Type of circuit	:	*3 phase 4 wire* *2 phases of a 3 phase 4 wire, 1 phase 3 wire,* *1 phase 2 wire*
No. of Elements	:	*Three*
Basic Current (Ib/In)	:	*5A, 10A or 20A*
Maximum Current (Im)	:	*120A*
Reference Supply Voltage	:	*Un 230V, Umin 220V*
Rated Frequency	:	*50Hz*
Pulse output constant	:	*1000* p/kWh *1000* p/kvarh
Manufactures Serial No.	:	*317.2 / 01* *317.2 / 02* *317.2 / 03* *A109800123* *A109800124*

DISPLAY OF THE MEASURED VALUES X-Ref. 4.2.11

Meter Register type: Electronic Display

In the case of a electronic display the corresponding non-volatile memory shall have a minimum retention time of four months.

Actual reported retention time of non-volatile memory: >10 Years

In the case of multiple values presented by a single display it shall be possible to display the content of all relevant memories, with the identification of each tariff: Conformance

The active tariff shall be indicated: Conformance

The principle units for the measured values: Conformance

The register shall be able to record and display, starting from zero for a minimum of 1500 h, the energy corresponding to maximum current at reference voltage and unity power factor; i.e.

Minimum register capacity allowed: 124200 k units

Actual register capacity: 999999 k units

Every numerical element of an electronic display shall be able to show all numbers from "zero" to "nine": Conformance

The marking of the meter samples with respect to both name-plates and connection diagrams conformed to section X-Ref. 4.2.13

SUPPORTING DOCUMENTATION

Accredited Laboratory tests reports:

Short Term Over-current
X-Ref. 5.4.3: *External 'NAMAS' Laboratory No.1172 CENtra Testing Station*
Test Report No.AA486/97C Issued 22nd June 1998

Radio Interference Measurement
X-Ref. 5.5.5: *External 'NAMAS' Laboratory No.1215IFR Ltd*
Test Report No.TC98/027 Issued 26th June 1998

Damp Heat Cyclic test
X-Ref. 5.3.3: *External 'NAMAS' Laboratory No.0122 Graseby Dynamics Ltd*
Test Report No. 4365 Issued 24th March 1998

Vibration Test
X-Ref. 5.2.3: *External 'NAMAS' Laboratory No.0135 BSI Product Testing*
Test Report No. 229/000135 Issued 14th April 1998

Shock Test
X-Ref. 5.2.2: *External 'NAMAS' Laboratory No.0122 Graseby Dynamics Ltd*
Test Report No. 4360 Issued 19th March 1998

Protection against Dust & Water
X-Ref. 5.2.5: *External 'NAMAS' Laboratory No.0135 BSI Product Testing*
Test Report No. 229/000135 Issued 14th April 1998

Test of Resistance to Heat & Fire
X-Ref. 5.2.4: *External 'NAMAS' Laboratory No.0135 BSI Product Testing*
Test Report No. CL0011570 Issued 18th July 1996
Materials subject of previous Meter Approval No.866

Additional information :

Offer Approval of meter Type 5057 Approval No.866 Dated 20th August 1996

1 INSULATION X-Ref. 5.4.6

Test Results ID / Sample No.	Test Procedure :	TP009/TP016 T/T KWH TEST CRITERIA 1 T/T KVARH TEST CRITERIA 1
O1 IW, 02 IW / A109800123		

1.1 Impulse Voltage Test X-Ref. 5.4.6.2

Impulse specification : Test level 6kV @ 0.5J open circuit
Time between impulse's 3s.

The meter samples were placed on a flat conducting earth surface with the case wrapped in a conductive foil.

The test voltage was applied 10 times in each polarity between the points listed below:-

1) with one terminal of the voltage circuit connect to earth, the impulse voltage was applied between the common voltage/current meter terminal and earth.

2) with all meter terminals connected together, impulse voltage was applied between the meter terminals and earth.

During the tests auxiliary circuits with reference rated voltage ≤ 40V were connected to earth.

1.2 AC Voltage Test X-Ref. 5.4.6.3

Test level 2kV & 4kV Test duration 1 minute.

The a.c. voltage tests were conducted as follows:-

1) between all meter voltage and current circuits connected together, and earth..

2) between all circuits not intended to be connected together in service, and earth.

The earth consisting of a conductive foil wrapped around the meter and connected to a flat conducting earth surface, upon which the meter was placed.

During the tests auxiliary circuits with reference rated voltage ≤ 40V were connected to earth.

On completion of the above tests, the meters were found to function correctly and within the accuracy specification when subsequently operated under reference operating conditions, with no signs of damage or degradation in the meter's insulation properties.

2 ACCURACY REQUIREMENTS X-Ref. 5.6

2.1 Meter Constant X-Ref. 5.6.6

The relation between the test output and the meter energy registers were checked to ensure the constant marking on the meter nameplate.

Test Results ID / Sample No.		Test Procedure :	T/T REGISTER IMP KWH T/T REGISTER KVARH IMP
A317 METER CONST	A109800124		

Measurement mode - Active Import Energy kWh

Test conditions : *Un: 230V Im: 100A Cos. $\phi = 1.0$, 50Hz*

Test Circuit : 3 *phase 4 wire*

Energy registered by the meter : *4.998* kWh

Test duration :- True energy recorded : *5.0000* kWh

kWh Register % Error : *-0.04*
LED Test output % Error : *-0.03*

Measurement mode - Reactive Import Energy kvarh

Test conditions : *Un: 230V Im: 100A Sin $\phi = 1.0$, 50Hz*

Test Circuit : 3 *phase 4 wire*

Test duration :- True energy recorded : *5.0000* kvarh

Energy registered by the meter : *4.990* kvarh

kvarh Register % Error : *-0.20%*
LED Test output % Error : *-0.17%*

During the registration tests, rate registers not active were found not to have been corrupted.

2.2 Starting condition X-Ref. 5.6.5

Initial Start-up of the meter X-Ref. 4.6.4.1

Test Results ID / Sample No.
03BJ / A109800124

The meter sample's were fully functional within 5s after rated voltage Un was applied to the meter terminals.

Starting X-Ref. 4.6.4.3

Test Results ID / Sample No.
A317.2 NON RRG & START /317.2/01, 02, &03

The meters commenced and continued to measure the applied active and reactive power in the import direction.

Test conditions for Direct Connected meters
Class 1 Active meters : Umin, 0.4%Ib, Cos. $\phi = 1.0$, 50Hz
Class 2 Reactive meters : Umin, 0.5%Ib, Sin $\phi = 1.0$, 50Hz

2.3 Running with No-Load X-Ref. 5.6.4
X-Ref. 4.6.4.2

Test Results ID / Sample No.	
03BJ	A109800124

Tests were conducted as follows;

Test conditions : *115% Un, current circuits open*

The minimum test duration in minutes being given by

$$\Delta t \geq \frac{600 \times 10^6}{k \cdot m \cdot Un \cdot Imax} \quad \text{[min] for meter of class 1}$$

where

k is the meter output constant (pulses per kWh)
m is the number of measuring elements

The meter samples were tested for a period of at least $\Delta t = 720$ minutes, on completion of which, no changes in the energy registers were recorded, and the test output did not produce more than one pulse.

2.4 Influence of ambient temperature

X-Ref. 5.6.3
X-Ref. 4.6.3

Test Results ID / Sample No. A137.2 TEMP CO. / 317.2/03	Test Procedure :	T/T TEMP INFLU EN IEC 61036 T/T KWH TEST CRITERIA 1 T/T KVARH TEST CRITERIA 1 TP021

Test conditions:	*Un: 230V*	*Fn: 50Hz*
	Ib/In: 5A	*Im: 120A*
Test Circuit:	*3 phase 4 wire*	

Measurement mode - Active Import Energy kWh

Temperature /°C	Current	PF Cos. ϕ	*% Error*	*Mean Temperature coefficient %/K*
33	0.1Ib	1.0	*-0.73*	*-0.036*
13	0.1Ib	1.0	*-0.02*	
33	0.2Ib	0.5ind	*-0.46*	*-0.012*
13	0.2Ib	0.5ind	*-0.22*	
33	Ib	1.0	*-0.26*	*-0.011*
13	Ib	1.0	*-0.05*	
33	Ib	0.5ind	*+0.15*	*+0.002*
13	Ib	0.5ind	*+0.11*	
33	Im	1.0	*-0.51*	*-0.015*
13	Im	1.0	*-0.22*	
33	Im	0.5ind	*-0.57*	*+0.019*
13	Im	0.5ind	*-0.95*	

Limit of Mean Temperature coefficient for :	Class 1	±0.05%/K @ Cos. ϕ = 1.0
		±0.07%/K @ Cos. ϕ = 0.5ind
	Class 2	±0.10%/K @ Cos. ϕ = 1.0
		±0.15%/K @ Cos. ϕ = 0.5ind

Influence of ambient temperature cont.

Operation of meter at the limit of the specified operating temperature range (Indoor meters)

X-Ref. 4.3.1

Test conditions: *Un: 230V* *Fn: 50Hz* *PF: Cos. ϕ = 1.0*
Ib/In: 5A *Im: 120A*

Temperature /°C	Current	PF Cos. ϕ	*% Error*
-10°C	0.1Ib	1.0	*+0.35*
45°C	0.1Ib	1.0	*-0.71*
-10°C	0.2Ib	0.5ind	*+0.44*
45°C	0.2Ib	0.5ind	*-0.34*
-10°C	Ib	1.0	*+0.30*
45°C	Ib	1.0	*-0.44*
-10°C	Ib	0.5ind	*+0.63*
45°C	Ib	0.5ind	*+0.29*
-10°C	Im	1.0	*+0.05*
45°C	Im	1.0	*-0.73*
-10°C	Im	0.5ind	*-0.60*
45°C	Im	0.5ind	*-0.67*

Limits of % Error: Class accuracy.

Operation of meter at the Limit of temperature range (Indoor meters)

X-Ref. 4.3.1

Test conditions: *Un: 230V* *Fn: 50Hz* *PF: Cos. ϕ = 1.0*
Ib/In: 5A *Im: 120A*

Temperature /°C	Current	*% Error*
55°C	Ib	*-0.55*
-20°C	Ib	*+0.37*

On completion of the above tests, the meters were found to function correctly and within the accuracy specification when subsequently operated under reference operating conditions.

2.5 Influence Quantities

X-Ref. 5.6.2

2.5.1 Variation in current

X-Ref. 4.6.1

Test Results ID / Sample No.	Test Procedure :	T/T 3P 4W REV1 S/H,V,Hz,A,RPS
A317.2 BASIC ACC / 317.2 / 01		

Test conditions: *Un: 230V* *Fn: 50Hz*
Ib/In: 5A *Im: 120A*
Test Circuit: *3 phase 4 wire*

Measurement mode - Active Import Energy kWh

317.2/01			Limit of % Error	
CURRENT	PF Cos. ϕ	*% Error*	Accuracy	
			Class 1	Class 2
(0.02 In)	1.0	*-0.99*	(±1.5)	(±2.5)
0.05 Ib (In)	-	*-0.55*	±1.5 (±1.0)	±2.5 (±2.0)
0.1 Ib	-	*-0.36*	±1.0	±2.0
0.2 Ib	-	*-0.01*	±1.0	±2.0
0.5 Ib	-	*+0.14*	±1.0	±2.0
Ib	-	*-0.17*	±1.0	±2.0
0.4 Im	-	*+0.15*	±1.0	±2.0
0.6 Im	-	*-0.01*	±1.0	±2.0
0.8 Im	-	*-0.09*	±1.0	±2.0
Im	-	*-0.29*	±1.0	±2.0
(0.05 In)	0.5ind	*-0.95*	(±1.5)	(±2.5)
0.1 Ib (In)	-	*-0.75*	±1.5 (±1.0)	±2.5 (±2.0)
0.2 Ib	-	*-0.08*	±1.0	±2.0
0.5 Ib	-	*+0.04*	±1.0	±2.0
Ib	-	*-0.10*	±1.0	±2.0
Im	-	*-0.55*	±1.0	±2.0
(0.1 In)	0.25ind	*-0.83*	(±3.5)	-
0.2 Ib	-	*-0.44*	±3.5	-
0.5 Ib	-	*-0.05*	±3.5	-
Ib	-	*-0.17*	±3.5	-
0.1 Ib (In)	0.8cap	*-0.34*	±1.5(±1.0)	-
0.2 Ib	-	*-0.02*	±1.0	-
0.5 Ib	-	*+0.16*	±1.0	-
Ib	-	*-0.09*	±1.0	-
(0.1 In)	0.5cap	*-0.48*	(±2.5)	-
0.2 Ib	-	*+0.10*	±2.5	-
0.5 Ib	-	*+0.22*	±2.5	-
Ib	-	*-0.06*	±2.5	-

Polyphase meter carrying a single-phase load, with balanced voltage applied to the voltage's circuits.

X-Ref. 4.6.1

Test conditions:	*Un: 230A*	*Fn: 50Hz*
	Ib/In: 5A	*Im: 120A*

Test Circuit: *3 phase 4 wire*

Measurement mode - Active Import Energy kWh

317.2/01						
Elements/Lines		I1 Element L1	I2 Element L2	I3 Element L3	Limit of % Error	
CURRENT	PF Cos. ϕ	*% Error*	*% Error*	*% Error*	Accuracy	
					Class 1	Class 2
(0.05 In)	1.0	*-1.51*	*-1.09*	*-0.93*	(±2.0)	(±3.0)
0.1 Ib	-	*-0.46*	*-0.73*	*-0.55*	±2.0	±3.0
0.2 Ib	-	*+0.01*	*+0.06*	*-0.42*	±2.0	±3.0
0.5 Ib	-	*+0.21*	*+0.38*	*-0.05*	±2.0	±3.0
Ib	-	*-0.12*	*-0.19*	*-0.01*	±2.0	±3.0
Im	-	*±0.00*	*-0.26*	*-0.33*	±2.0	±3.0
(0.1 In)	0.5ind	*-1.02*	*-1.23*	*-1.29*	(±2.0)	(±3.0)
0.2 Ib	-	*-0.21*	*-0.44*	*-0.85*	±2.0	±3.0
0.5 Ib	-	*+0.35*	*-0.08*	*-0.21*	±2.0	±3.0
Ib	-	*-0.01*	*-0.19*	*-0.35*	±2.0	±3.0
Im	-	*-0.53*	*-0.63*	*-0.58*	±2.0	±3.0
0.2 Ib	0.5cap	*-0.44*	*+0.11*	*-0.50*	-	-
Ib	-	*-0.40*	*-0.23*	*±0.00*	-	-
Im	-	*-0.14*	*-0.06*	*-0.31*	-	-

Variation in current **cont.** X-Ref. 4.6.1

Test Results ID / Sample No.	Test Procedure :
A317.2 BASIC ACC +Q / 317.2 / 01	T/T Q 1PH 2W V,Hz,W,A,S/H T/T Q 3PH 3W V,Hz,A,S/H T/T Q 3PH 4W V,Hz,W,A,S/H T/T IMPORT KVARH 1PH 2W T/T IMPORT KVARH 3PH 3W T/T IMPORT KVARH 3PH 4W

Test conditions: *Un: 230V* *Fn: 50Hz*
Ib/In: 5A *Im: 120A*

Test Circuit: *3 phase 4 wire*

Measurement mode - Reactive Import Energy kvarh

317.2/01			Limit of % Error	
CURRENT	PF Sin ϕ	*% Error*	Accuracy	
			Class 2	Class 3
0.05 Ib (In)	1.0	*-0.52*	±2.5 (±2.0)	±4.0 (±3.0)
0.1 Ib	-	*-0.60*	±2.0	±3.0
0.2 Ib	-	*-0.29*	±2.0	±3.0
0.5 Ib	-	*-0.11*	±2.0	±3.0
Ib	-	*-0.15*	±2.0	±3.0
0.4 Im	-	*+0.07*	±2.0	±3.0
0.6 Im	-	*-0.04*	±2.0	±3.0
0.8 Im	-	*-0.07*	±2.0	±3.0
Im	-	*-0.19*	±2.0	±3.0
0.1 Ib (In)	0.5ind	*-0.03*	±2.5 (±2.0)	±4.0 (±3.0)
0.2 Ib	-	*+0.14*	±2.0	±3.0
0.5 Ib	-	*+0.35*	±2.0	±3.0
Ib	-	*+0.08*	±2.0	±3.0
Im	-	*+0.41*	±2.0	±3.0
0.2 Ib	0.25ind	*+0.72*	±7.0	±10.0
0.5 Ib	-	*+0.88*	±7.0	±10.0
Ib	-	*+0.62*	±7.0	±10.0
0.2 Ib	0.5cap	*-0.92*	±2.0	±3.5
0.5 Ib	-	*-0.59*	±2.0	±3.0
Ib	-	*-0.57*	±2.0	±3.0
Im	-	*-0.82*	±2.0	±3.0
0.2 Ib	0.25cap	*-1.62*	±7.0	±10.0
0.5 Ib	-	*-1.13*	±7.0	±10.0
Ib	-	*-1.17*	±7.0	±10.0

Polyphase meter carrying a single-phase load, with balanced voltage applied to the voltage's circuits.

X-Ref. 4.6.1

Test conditions: *Un: 230V* *Fn: 50Hz*
Ib/In: 5A *Im: 100A*

Test Circuit: *3 phase 4 wire*

Measurement mode - Reactive Import Energy kvarh

317.2/01						
Elements/Lines		I1 Element L1	I2 Element L2	I3 Element L3	Limit of % Error	
CURRENT	PF Sin ϕ	*% Error*	*% Error*	*% Error*	Accuracy	
					Class 2	Class 3
0.1 Ib	1.0	*-0.60*	*-0.28*	*+0.76*	±3.0	±4.0
Ib	-	*-0.77*	*-0.07*	*-0.05*	±3.0	±4.0
Im	-	*-0.23*	*-0.17*	*-0.07*	±3.0	±4.0
0.2 Ib	0.5ind	*+0.07*	*+0.70*	*+1.34*	±3.0	±4.0
Ib	-	*+0.10*	*+0.35*	*+0.69*	±3.0	±4.0
Im	-	*+0.36*	*+0.42*	*+0.54*	±3.0	±4.0
0.2 Ib	0.5cap	*-0.51*	*-0.60*	*-0.04*	±3.0	±4.0
Ib	-	*-0.46*	*-0.76*	*-0.37*	±3.0	±4.0
Im	-	*-0.73*	*-0.79*	*-0.90*	±3.0	±4.0

Variation in current cont. X-Ref. 4.6.1

Test Results ID / Sample No.	Test Procedure :	T/T 3P 4W REV1 S/H,V,Hz,A,RPS
A317 5165 +P TT / A109800124		

Test conditions: *Un: 230V* *Fn: 50Hz*
Ib/In: 5A *Im: 120A*
Test Circuit: *3 phase 4 wire*

Measurement mode - Active Import Energy kWh

A109800124			Limit of % Error	
CURRENT	PF Cos. ϕ	*% Error*	Accuracy	
			Class 1	Class 2
(0.02 In)	1.0	*-0.61*	(±1.5)	(±2.5)
0.05 Ib (In)	-	*-0.49*	±1.5 (±1.0)	±2.5 (±2.0)
0.1 Ib	-	*-0.20*	±1.0	±2.0
0.2 Ib	-	*+0.45*	±1.0	±2.0
0.5 Ib	-	*+0.33*	±1.0	±2.0
Ib	-	*+0.10*	±1.0	±2.0
0.4 Im	-	*+0.28*	±1.0	±2.0
0.6 Im	-	*+0.25*	±1.0	±2.0
0.8 Im	-	*+0.14*	±1.0	±2.0
Im	-	*+0.02*	±1.0	±2.0
(0.05 In)	0.5ind	*-0.65*	(±1.5)	(±2.5)
0.1 Ib (In)	-	*+0.07*	±1.5 (±1.0)	±2.5 (±2.0)
0.2 Ib	-	*+0.70*	±1.0	±2.0
0.5 Ib	-	*+0.48*	±1.0	±2.0
Ib	-	*+0.16*	±1.0	±2.0
Im	-	*-0.13*	±1.0	±2.0
(0.1 In)	0.25ind	*+0.48*	(±3.5)	-
0.2 Ib	-	*+0.64*	±3.5	-
0.5 Ib	-	*+0.52*	±3.5	-
Ib	-	*+0.33*	±3.5	-
0.1 Ib (In)	0.8cap	*-0.44*	±1.5(±1.0)	-
0.2 Ib	-	*+0.13*	±1.0	-
0.5 Ib	-	*+0.30*	±1.0	-
Ib	-	*+0.08*	±1.0	-
(0.1 In)	0.5cap	*-1.01*	(±2.5)	-
0.2 Ib	-	*-0.13*	±2.5	-
0.5 Ib	-	*+0.12*	±2.5	-
Ib	-	*-0.05*	±2.5	-

Polyphase meter carrying a single-phase load, with balanced voltage applied to the voltage's circuits.

X-Ref. 4.6.1

Test conditions: *Un: 230A* *Fn: 50Hz*
Ib/In: 5A *Im: 120A*

Test Circuit: *3 phase 4 wire*

Measurement mode - Active Import Energy kWh

A109800124						
Elements/Lines		I1 Element L1	I2 Element L2	I3 Element L3	Limit of % Error	
CURRENT	PF Cos. ϕ	*% Error*	*% Error*	*% Error*	Accuracy	
					Class 1	Class 2
(0.05 In)	1.0	*-0.63*	*-1.55*	*-1.74*	(±2.0)	(±3.0)
0.1 Ib	-	*-0.53*	*-0.62*	*-0.60*	±2.0	±3.0
0.2 Ib	-	*+0.22*	*+0.01*	*+0.04*	±2.0	±3.0
0.5 Ib	-	*+0.41*	*+0.19*	*+0.25*	±2.0	±3.0
Ib	-	*+0.09*	*+0.02*	*+0.20*	±2.0	±3.0
Im	-	*+0.07*	*-0.05*	*+0.18*	±2.0	±3.0
(0.1 In)	0.5ind	*-0.69*	*-0.43*	*-1.46*	(±2.0)	(±3.0)
0.2 Ib	-	*+0.02*	*+0.57*	*-0.15*	±2.0	±3.0
0.5 Ib	-	*-0.10*	*+0.84*	*-0.03*	±2.0	±3.0
Ib	-	*-0.30*	*+0.50*	*-0.15*	±2.0	±3.0
Im	-	*-0.09*	*+0.13*	*-0.01*	±2.0	±3.0
0.2 Ib	0.5cap	*-0.31*	*-1.31*	*-0.35*	-	-
Ib	-	*+0.24*	*-0.52*	*+0.13*	-	-
Im	-	*+0.38*	*-0.36*	*+0.18*	-	-

Variation in current **cont.** X-Ref. 4.6.1

Test Results ID / Sample No. A317 5165 +Q T/T / A109800124	Test Procedure :	T/T Q 1PH 2W V,Hz,W,A,S/H T/T Q 3PH 3W V,Hz,A,S/H T/T Q 3PH 4W V,Hz,W,A,S/H T/T IMPORT KVARH 1PH 2W T/T IMPORT KVARH 3PH 3W T/T IMPORT KVARH 3PH 4W

Test conditions: *Un: 230V* *Fn: 50Hz*
Ib/In: 5A *Im: 120A*

Test Circuit: *3 phase 4 wire*

Measurement mode - Reactive Import Energy kvarh

A109800124			Limit of % Error	
CURRENT	PF Sin ϕ	*% Error*	Accuracy	
			Class 2	Class 3
0.05 Ib (In)	1.0	*-1.00*	±2.5 (±2.0)	±4.0 (±3.0)
0.1 Ib	-	*-0.30*	±2.0	±3.0
0.2 Ib	-	*+0.20*	±2.0	±3.0
0.5 Ib	-	*+0.21*	±2.0	±3.0
Ib	-	*-0.07*	±2.0	±3.0
0.4 Im	-	*+0.09*	±2.0	±3.0
0.6 Im	-	*+0.04*	±2.0	±3.0
0.8 Im	-	*-0.05*	±2.0	±3.0
Im	-	*-0.14*	±2.0	±3.0
0.1 Ib (In)	0.5ind	*-1.06*	±2.5 (±2.0)	±4.0 (±3.0)
0.2 Ib	-	*-0.35*	±2.0	±3.0
0.5 Ib	-	*+0.02*	±2.0	±3.0
Ib	-	*-0.15*	±2.0	±3.0
Im	-	*+0.26*	±2.0	±3.0
0.2 Ib	0.25ind	*-1.20*	±7.0	±10.0
0.5 Ib	-	*-0.25*	±7.0	±10.0
Ib	-	*-0.31*	±7.0	±10.0
0.2 Ib	0.5cap	*+0.13*	±2.0	±3.5
0.5 Ib	-	*+0.24*	±2.0	±3.0
Ib	-	*-0.19*	±2.0	±3.0
Im	-	*-0.56*	±2.0	±3.0
0.2 Ib	0.25cap	*-0.19*	±7.0	±10.0
0.5 Ib	-	*+0.06*	±7.0	±10.0
Ib	-	*-0.54*	±7.0	±10.0

Polyphase meter carrying a single-phase load, with balanced voltage applied to the voltage's circuits. X-Ref. 4.6.1

Test conditions:	*Un: 230V*	*Fn: 50Hz*
	Ib/In: 5A	*Im: 100A*

Test Circuit: *3 phase 4 wire*

Measurement mode - Reactive Import Energy kvarh

A109800124						
Elements/Lines		I1 Element L1	I2 Element L2	I3 Element L3	Limit of % Error	
CURRENT	PF Sin ϕ	*% Error*	*% Error*	*% Error*	Accuracy	
					Class 2	Class 3
0.1 Ib	1.0	*-0.80*	*-1.32*	*-0.87*	±3.0	±4.0
Ib	-	*-0.06*	*-0.15*	*-0.08*	±3.0	±4.0
Im	-	*-0.16*	*-0.21*	*-0.14*	±3.0	±4.0
0.2 Ib	0.5ind	*-0.75*	*-1.97*	*-0.51*	±3.0	±4.0
Ib	-	*-0.01*	*-0.71*	*+0.11*	±3.0	±4.0
Im	-	*+0.17*	*-0.28*	*+0.50*	±3.0	±4.0
0.2 Ib	0.5cap	*-0.60*	*-0.48*	*-0.79*	±3.0	±4.0
Ib	-	*-0.28*	*+0.08*	*-0.65*	±3.0	±4.0
Im	-	*-0.71*	*-0.36*	*-0.92*	±3.0	±4.0

Variation in current **cont.** X-Ref. 4.6.1

Test Results ID / Sample No.	Test Procedure :	T/T IMPORT WH 1PH 2W
A317 1Ph 2W P/Q / A109800124		

Test conditions: *Un: 230V* *Fn: 50Hz*
Ib/In: 5A *Im: 120A*

Test Circuit *Each Element of a Polyphase meter tested individual as 1 phase 2 wire*

Measurement mode - Active Import Energy kWh

A109800124					Limit of % Error	
CURRENT	PF Cos. φ	*% Error* Element L1	*% Error* Element L2	*% Error* Element L3	Accuracy	
					Class 1	Class 2
(0.02 In)	1.0	*-0.75*	*+0.80*	*-0.69*	(±1.5)	(±2.5)
0.05 Ib (In)	-	*+0.23*	*-0.08*	*-0.10*	±1.5 (±1.0)	±2.5 (±2.0)
0.1 Ib	-	*+0.22*	*+0.03*	*+0.31*	±1.0	±2.0
0.2 Ib	-	*+0.30*	*+0.39*	*+0.38*	±1.0	±2.0
0.5 Ib	-	*+0.29*	*+0.45*	*+0.37*	±1.0	±2.0
Ib	-	*+0.01*	*+0.16*	*+0.21*	±1.0	±2.0
0.4 Im	-	*+0.40*	*+0.26*	*+0.28*	±1.0	±2.0
0.6 Im	-	*+0.31*	*+0.16*	*+0.30*	±1.0	±2.0
0.8 Im	-	*+0.20*	*+0.06*	*+0.21*	±1.0	±2.0
Im	-	*+0.10*	*-0.07*	*+0.16*	±1.0	±2.0
(0.05 In)	0.5ind	*+0.57*	*+0.74*	*+0.79*	(±1.5)	(±2.0)
0.1 Ib (In)	-	*+0.36*	*+1.46*	*-0.22*	±1.5 (±1.0)	±2.5 (±2.0)
0.2 Ib	-	*+0.09*	*+1.88*	*+0.24*	±1.0	±2.5
0.5 Ib	-	*+0.01*	*+0.97*	*+0.07*	±1.0	±2.5
Ib	-	*-0.25*	*+0.64*	*-0.10*	±1.0	±2.5
Im	-	*-0.19*	*+0.09*	*-0.06*	±1.0	±2.5
0.2 Ib	0.25ind	*-0.15*	*+3.40*	*-0.06*	±3.5	-
0.5 Ib	-	*-0.42*	*+2.22*	*-0.30*	±3.5	-
Ib	-	*-0.88*	*+1.17*	*-0.54*	±3.5	-
0.1 Ib (In)	0.8cap	*-0.37*	*-0.46*	*+0.52*	±1.5 (±1.0)	-
0.2 Ib	-	*+0.61*	*-0.01*	*+0.54*	±1.0	-
0.5 Ib	-	*+0.46*	*+0.06*	*+0.47*	±1.0	-
Ib	-	*+0.20*	*-0.13*	*+0.32*	±1.0	-
0.2 Ib	0.5cap	*-0.01*	*+0.10*	*+0.40*	±2.5	-
0.5 Ib	-	*+0.33*	*-0.33*	*+0.59*	±2.5	-
Ib	-	*+0.22*	*-0.46*	*+0.52*	±2.5	-

Variation in current **cont.** X-Ref. 4.6.1

Test Results ID / Sample No.	Test Procedure :	T/T Q 1PH 2W V,Hz,W,A,S/H T/T IMPORT KVARH 1PH 2W
A317 1Ph 2W P/Q / A109800124		

Test conditions: *Un: 230V* *Fn: 50Hz*
Ib/In: 5A *Im: 120A*

Test Circuit: *Each Element of a Polyphase meter tested individual as 1 phase 2 wire*

Measurement mode - Reactive Import Energy kvarh

A109800124					Limit of % Error	
CURRENT	PF Sin φ	*% Error* Element L1	*% Error* Element L2	*% Error* Element L3	Accuracy	
					Class 2	Class 3
0.05 Ib (In)	1.0	*-1.04*	*-1.25*	*-0.68*	±2.5 (±2.0)	±4.0 (±3.0)
0.1 Ib	-	*-0.16*	*-0.50*	*-0.09*	±2.0	±3.0
0.2 Ib	-	*+0.39*	*+0.27*	*+0.38*	±2.0	±3.0
0.5 Ib	-	*+0.33*	*+0.27*	*+0.37*	±2.0	±3.0
Ib	-	*+0.09*	*+0.01*	*+0.03*	±2.0	±3.0
0.4 Im	-	*+0.21*	*+0.11*	*+0.05*	±2.0	±3.0
0.6 Im	-	*+0.12*	*+0.04*	*+0.04*	±2.0	±3.0
0.8 Im	-	*+0.02*	*-0.06*	*+0.01*	±2.0	±3.0
Im	-	*-0.12*	*-0.20*	*-0.11*	±2.0	±3.0
0.1 Ib (In)	0.5ind	*-1.09*	*-1.73*	*+0.13*	±2.5 (±2.0)	±4.0 (±3.0)
0.2 Ib	-	*+0.30*	*-0.91*	*+0.55*	±2.0	±3.0
0.5 Ib	-	*+0.45*	*-0.48*	*+0.82*	±2.0	±3.0
Ib	-	*+0.30*	*-0.43*	*+0.56*	±2.0	±3.0
Im	-	*+0.30*	*-0.24*	*+0.73*	±2.0	±3.0
0.2 Ib	0.25ind	*-0.85*	*-2.24*	*+0.33*	±7.0	±10.0
0.5 Ib	-	*+0.12*	*-1.35*	*+1.30*	±7.0	±10.0
Ib	-	*+0.27*	*-1.13*	*+1.29*	±7.0	±10.0
0.2 Ib	0.5cap	*+0.34*	*+0.62*	*+0.07*	±2.0	±3.5
0.5 Ib	-	*+0.13*	*+0.63*	*-0.28*	±2.0	±3.0
Ib	-	*-0.13*	*+0.44*	*-0.58*	±2.0	±3.0
Im	-	*-0.56*	*-0.19*	*-0.89*	±2.0	±3.0
0.2 Ib	0.25cap	*-0.25*	*+1.85*	*-1.38*	±7.0	±10.0
0.5 Ib	-	*-0.57*	*+1.28*	*-0.99*	±7.0	±10.0
Ib	-	*-0.81*	*+0.78*	*-1.42*	±7.0	±10.0

Variation in current cont.. X-Ref. 4.6.1

Test Results ID / Sample No.	
A317 2Ph &N P/Q /	A109800124

Test conditions: *Un: 230V* *Fn: 50Hz*
Ib/In: 5A *Im: 120A*

Test Circuit *2 phases of a 3 phase 4 wire*

(Note during testing the meter measurement circuits of element L2 were open.)

Measurement mode - Active Import Energy kWh

A109800124			Limit of % Error	
CURRENT	PF Cos. ϕ	*% Error*	Accuracy	
			Class 1	Class 2
0.05 Ib (In)	1.0	*-1.03*	±1.5 (±1.0)	±2.5 (±2.0)
0.5 Ib	-	*+0.36*	±1.0	±2.0
Ib	-	*+0.09*	±1.0	±2.0
Im	-	*+0.07*	±1.0	±2.0
0.5 Ib	0.5ind	*+0.03*	±1.0	±2.0
Ib	-	*-0.23*	±1.0	±2.0
Im	-	*-0.33*	±1.0	±2.0

Polyphase meter carrying a single-phase load, with balanced voltage applied to the voltage's circuits. X-Ref. 4.6.1

Test conditions: *Un: 230V* *Fn: 50Hz*
Ib/In: 5A *Im: 120A*

Test Circuit *2 phases of a 3 phase 4 wire*

Measurement mode - Active Import Energy kWh

A109800124					
Elements/Lines		I1 Element L1	I3 Element L3	Limit of % Error	
CURRENT	PF Cos. ϕ	*% Error*	*% Error*	Accuracy	
				Class 1	Class 2
Ib	1.0	*-0.01*	*+0.15*	±2.0	±3.0
Ib	0.5ind	*-0.35*	*-0.26*	±2.0	±3.0

File Reference No. T/166/279/119
Action No.317

Variation in current **cont.. ..** X-Ref. 4.6.1

Test Results ID / Sample No.

A317 2Ph + N P/Q / A109800124

Test conditions: *Un: 230V* *Fn: 50Hz*
Ib/In: 5A *Im: 120V*

Test Circuit *2 phases of a 3 phase 4 wire*

(Note during testing the meter measurement circuits of element L2 were open.)

Measurement mode - Reactive Import Energy kvarh

A109800124			Limit of % Error	
CURRENT	PF Sin ϕ	*% Error*	Accuracy	
			Class 2	Class 3
0.1 Ib	1.0	*-0.36*	±2.0	±3.0
0.5 Ib	-	*+0.29*	±2.0	±3.0
Ib	-	*-0.05*	±2.0	±3.0
Im	-	*-0.10*	±2.0	±3.0
Ib	0.5ind	*+0.03*	±2.0	±3.0

Polyphase meter carrying a single-phase load, with balanced voltage applied to the voltage's circuits. X-Ref. 4.6.1

Test conditions: *Un: 230V* *Fn: 50Hz*
Ib/In: 5A *Im: 120A*

Test Circuit *2 phases of a 3 phase 4 wire*

Measurement mode - Reactive Import Energy kvarh

A109800124					
Elements/Lines		I1 Element L1	I3 Element L3	Limit of % Error	
CURRENT	PF Sin ϕ	% Error	% Error	Accuracy	
				Class 2	Class 3
Ib	1.0	*-0.09*	*-0.05*	±3.0	±4.0
Ib	0.5ind	*+0.05*	*+0.36*	±3.0	±4.0

Variation in current **cont..** X-Ref. 4.6.1

Test Results ID / Sample No.

A317 1Ph 3w P/Q / A109800124

Test conditions: *Un: 230* *Fn: 50Hz*
Ib/In: 5A *Im: 120A*

Test Circuit *1 phase 3 wire* *(180 electrical degree phase displacement)*

(Note during testing the meter measurement circuits of element L2 were open.)

Measurement mode - Active Import Energy kWh

A109800124			Limit of % Error	
CURRENT	PF Cos. ϕ	*% Error*	Accuracy	
			Class 1	Class 2
0.05 Ib (In)	1.0	*-0.64*	±1.5 (±1.0)	±2.5 (±2.0)
0.5 Ib	-	*+0.34*	±1.0	±2.0
Ib	-	*+0.13*	±1.0	±2.0
Im	-	*+0.03*	±1.0	±2.0
0.5 Ib	0.5ind	*+0.23*	±1.0	±2.0
Ib	-	*-0.09*	±1.0	±2.0
Im	-	*-0.36*	±1.0	±2.0

Polyphase meter carrying a single-phase load, with balanced voltage applied to the voltage's circuits. X-Ref. 4.6.1

Test conditions: *Un: 230V* *Fn: 50Hz*
Ib/In: 5A *Im: 120A*

Test Circuit *1 phase 3 wire* *(180 electrical degree phase displacement)*

Measurement mode - Active Import Energy kWh

A109800124					
Elements/Lines		I1 Element L1	I3 Element L3	Limit of % Error	
CURRENT	PF Cos. ϕ	*% Error*	*% Error*	Accuracy	
				Class 1	Class 2
Ib	1.0	*-0.03*	*+0.13*	±2.0	±3.0
Ib	0.5ind	*-0.24*	*-0.06*	±2.0	±3.0

Variation in current cont.. X-Ref. 4.6.1

Test Results ID / Sample No.
A317 1Ph 3w P/Q / A109800124

Test conditions: *Un:* *Fn: 50Hz*
Ib/In: *Im:*

Test Circuit *1 phase 3 wire* *(180 electrical degree phase displacement)*

(Note during testing the meter measurement circuits of element L2 were open.)

Measurement mode - Reactive Import Energy kvarh

A109800124			Limit of % Error	
CURRENT	PF Sin ϕ	*% Error*	Accuracy	
			Class 2	Class 3
0.1 Ib	1.0	*-0.34*	±2.0	±3.0
0.5 Ib	-	*+0.32*	±2.0	±3.0
Ib	-	*±0.00*	±2.0	±3.0
Im	-	*-0.13*	±2.0	±3.0
Ib	0.5ind	*+0.29*	±2.0	±3.0

Polyphase meter carrying a single-phase load, with balanced voltage applied to the voltage's circuits. X-Ref. 4.6.1

Test conditions: *Un:* *Fn: 50Hz*
Ib/In: *Im:*

Test Circuit *1 phase 3 wire* *(180 electrical degree phase displacement)*

Measurement mode - Reactive Import Energy kvarh

A109800124					
Elements/Lines		I1 Element L1	I3 Element L3	Limit of % Error	
CURRENT	PF Sin ϕ	*% Error*	*% Error*	Accuracy	
				Class 2	Class 3
Ib	1.0	*-0.08*	*-0.07*	±3.0	±4.0
Ib	0.5ind	*-0.05*	*+0.29*	±3.0	±4.0

2.5.2 Voltage Variation

X-Ref. 4.6.2

Specified Operating Range

Test Results ID / Sample No.	Test Procedure :	T/T 3P 4W REV1 S/H,V,Hz,A,RPS
A317.2 BASIC ACC#1 / 317.2 / 01		

Test conditions: *Un: 230V Umin: 220V Fn: 50Hz*
Ib/In: 5A Im: 120A

Test Circuit: *3 phase 4 wire*

Measurement mode - Active Energy kWh

		110% Un	100% Umin	90% Umin	Limit of % Error Variation	
Current	PF Cos. ϕ	*% Error*	*% Error*	*% Error*	Accuracy	
					Class 1	Class 2
0.05 Ib	1.0	*-0.71*	*-0.62*	*-0.43*	±0.7	±1.0
Ib	-	*-0.29*	*-0.26*	*-0.13*	±0.7	±1.0
Im	-	*-0.41*	*-0.37*	*-0.30*	±0.7	±1.0
0.1 Ib	0.5ind	*-0.37*	*-0.68*	*-0.62*	±1.0	±1.5
Ib	-	*-0.11*	*-0.25*	*-0.22*	±1.0	±1.5
Im	-	*-0.55*	*-0.62*	*-0.65*	±1.0	±1.5

Limit Range of Operation

		115% Un	80% Umin	Limit of % Error Variation	
Current	PF Cos. ϕ	*% Error*	*% Error*	Accuracy	
				Class 1	Class 2
Ib	1.0	*-0.23*	*-0.17*	±2.1	±3.0
Ib	0.5ind	*-0.21*	*-0.42*	±3.0	±4.5

Voltage Variation cont.

X-Ref. 4.6.2

Specified Operating Range

Test Results ID / Sample No.	Test Procedure :	T/T Q 3PH 4W V,Hz,W,A,S/H
A317.2 BASIC ACC + Q / 317.2 / 01		

Test conditions: *Un: 230V Umin: Fn: 50Hz*
Ib/In: 5A Im: 120A

Test Circuit: *3 phase 4 wire*

Measurement mode - Reactive Energy kvarh

		110% Un	100% Umin	90% Umin	Limit of % Error Variation	
Current	PF Sin ϕ	*% Error*	*% Error*	*% Error*	Accuracy	
					Class 2	Class 3
0.05 Ib	1.0	*-0.30*	*-0.61*	*-0.72*	±1.0	±2.0
Ib	-	*-0.05*	*-0.09*	*-0.05*	±1.0	±2.0
Im	-	*-0.08*	*-0.09*	*-0.08*	±1.0	±2.0
0.1 Ib	0.5ind	*+0.41*	*-0.08*	*-0.31*	±1.5	±3.0
Ib	-	*+0.40*	*+0.37*	*+0.37*	±1.5	±3.0
Im	-	*+0.61*	*+0.58*	*+0.63*	±1.5	±3.0

Limit Range of Operation

		115% Un	80% Umin	Limit of % Error Variation	
Current	PF Sin ϕ	*% Error*	*% Error*	Accuracy	
				Class 2	Class 3
Ib	1.0	*-0.10*	*-0.13*	±3.0	±6.0
Ib	0.5ind	*+0.27*	*+0.37*	±4.5	±9.0

2.5.3 Frequency Variation

X-Ref. 4.6.2

Test Results ID / Sample No.	Test Procedure :	T/T 3P 4W REV1 S/H,V,Hz,A,RPS
A317.2 BASIC ACC # 1 / 317.2 / 01		

Test conditions: *Un: 230V* *Fn: 50Hz*
Ib/In: 5A *Im: 100A*

Test Circuit: *3 phase 4 wire*

Measurement mode - Active Import Energy kWh

		105% Fn	100% Fn	95% Fn	Limit of % Error Variation	
Current	PF Cos. ϕ	*% Error*	*% Error*	*% Error*	Accuracy	
					Class 1	Class 2
0.05 Ib	1.0	*-0.53*	*-0.47*	*-0.45*	±0.5	±0.8
Ib	1.0	*-0.16*	*-0.12*	*-0.11*	±0.5	±0.8
Im	1.0	*-0.33*	*-0.27*	*-0.29*	±0.5	±0.8
0.10 Ib	0.5ind	*-0.95*	*-0.67*	*-0.22*	±0.7	±1.0
Ib	0.5ind	*-0.48*	*-0.20*	*+0.20*	±0.7	±1.0
Im	0.5ind	*-0.80*	*-0.57*	*-0.41*	±0.7	±1.0

Test Results ID / Sample No.	Test Procedure :	T/T Q 3PH 4W V,Hz,W,A,S/H
A317.2 BASIC ACC + Q / 317.2 / 01		

Test conditions: *Un: 230V* *Fn: 50Hz*
Ib/In: 5A *Im: 120A*

Test Circuit: *3 phase 4 wire*

Measurement mode - Reactive import Energy kvarh

		102% Fn	100% Fn	98% Fn	Limit of % Error Variation	
Current	PF Sins ϕ	*% Error*	*% Error*	*% Error*	Accuracy	
					Class 2	Class 3
0.05 Ib	1.0	*-0.31*	*-0.42*	*-0.38*	±2.5	±2.5
Ib	1.0	*-0.08*	*-0.16*	*-0.01*	±2.5	±2.5
Im	1.0	*-0.11*	*-0.18*	*-0.05*	±2.5	±2.5
0.10 Ib	0.5ind	*+0.41*	*+0.06*	*+0.03*	±2.5	±2.5
Ib	0.5ind	*+0.43*	*+0.21*	*+0.23*	±2.5	±2.5
Im	0.5ind	*+0.50*	*+0.40*	*+0.43*	±2.5	±2.5

2.5.4 Waveform : 10% of Third Harmonic in the Current X-Ref. 4.6.2

Test Results ID / Sample No.	Test Procedure : T/T 3P 4W REV1 S/H,V,Hz,A,RPS
A317.2 BASIC ACC # 1 / 317.2 / 01	

Test conditions: *Un: 230V* *Fn: 50Hz* *PF: Cos. ϕ = 1.0*
Ib/In: 5A *Im: 120A*

Harmonic current : 10% Ib/In, 150*Hz*
Distortion factor on the voltage waveform : < 0.5 % THD

Test Circuit: *3 phase 4 wire*

Measurement mode - Active Energy kWh

		Limit of % Error Variation	
Harmonic Phase displacement with respect to Fundamental	*% Error*	Accuracy	
		Class 1	Class 2
Fundamental Only			
0.05 Ib	*-0.36*	-	-
Ib	*-0.08*	-	-
Im	*-0.22*	-	-
Fundamental + 10% 3rd Harmonic Phase = 0°			
0.05 Ib	*-0.42*	±0.6	±0.8
Ib	*-0.15*	±0.6	±0.8
Im	*-0.28*	±0.6	±0.8
Fundamental + 10% 3rd Harmonic Phase = 180°			
0.05 Ib	*-0.48*	±0.6	±0.8
Ib	*-0.06*	±0.6	±0.8
Im	*-0.31*	±0.6	±0.8

Waveform : 10% of Third Harmonic in the Current cont. X-Ref. 4.6.2

Test Results ID / Sample No.		Test Procedure :	T/T Q 3PH 4W V,Hz,W,A,S/H
A317.2	BASIC ACC + Q		

Test conditions: *Un: 230V* *Fn: 50Hz* *PF: Sins $\phi = 1.0$*
Ib/In: 5A *Im: 120A*

Harmonic current : 10% Ib/In, 150*Hz*
Distortion factor on the voltage waveform : < 0.2 % THD

Test Circuit: *3 phase 4 wire*

Measurement mode - Reactive Energy kvarh

		Limit of % Error Variation	
Harmonic Phase displacement with respect to Fundamental	*% Error*	Accuracy	
		Class 2	Class 3
Fundamental Only			
0.05 Ib	*-0.45*	-	-
Ib	*-0.15*	-	-
Im	*-0.19*	-	-
Fundamental + 10% 3rd Harmonic Phase = 0°			
0.05 Ib	*-0.60*	±1.5	±1.5
Ib	*-0.23*	±1.5	±1.5
Im	*-0.20*	±1.5	±1.5
Fundamental + 10% 3rd Harmonic Phase = 180°			
0.05 Ib	*-0.53*	±1.5	±1.5
Ib	*-0.16*	±1.5	±1.5
Im	*-0.13*	±1.5	±1.5

2.5.5 Reversed Phase Sequence X-Ref. 4.6.2

Test Results ID / Sample No.	Test Procedure :	T/T 3P 4W REV1 S/H,V,Hz,A,RPS
A317.2 BASIC ACC # 1 / 317.2 / 01		

Test conditions: *Un: 230V* *Fn: 50Hz*
Ib/In: 5A *PF: Cos. ϕ = 1.0*

Test Circuit: *3 phase 4 wire*

Measurement mode - Active Import Energy kWh

		Limit of % Error Variation	
Phase Sequence Current	*% Error*	Accuracy	
		Class 1	Class 2
Sequence **L1-L2-L3** 0.1 Ib	*-0.28*	-	-
Sequence **L1-L3-L2** 0.1 Ib	*-0.23*	±1.5	±1.5

2.5.6 Voltage Unbalance X-Ref. 4.6.2

Test Results ID / Sample No.	Test Procedure :	T/T 3P 4W REV1 S/H,V,Hz,A,RPS
A317.2 BASIC ACC # 1 / 317.2 / 01		

Test conditions: *Un: 230V* *Fn: 50Hz*
Ib/In: 5A *PF: Cos. ϕ = 1.0*

Test Circuit: *3 phase 4 wire*

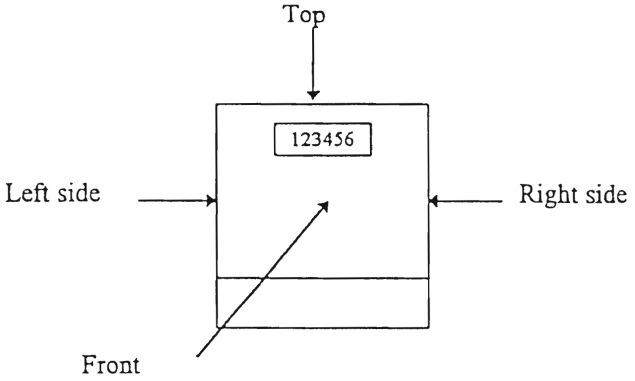
Measurement mode - Active Import Energy kWh

		Limit of % Error Variation	
Network Phase/Lines connected	*% Error*	Accuracy	
		Class 1	Class 2
L1 & L2 & L3	*-0.10*	-	-
L2 & L3	*-0.01*	±2.0	±4.0
L1 & L3	*-0.08*	±2.0	±4.0
L1 & L20	*-0.17*	±2.0	±4.0
L3	*-0.04*	±2.0	±4.0
L2	*-0.20*	±2.0	±4.0
L1	*-0.12*	±2.0	±4.0

2.5.7 Continuous Magnetic Induction of External Origin X-Ref. 4.6.2

The continuous magnetic induction was obtained using an electromagnetic coil of 1000 Ampere-turns. This magnetic field was applied to all accessible surfaces of the meter samples when mounted as for normal use.

Application of the continuous magnetic induction.



Test Results ID / Sample No.	Test Procedure :	T/T DC MAG FLD P MANUAL TP011
A317.2 DC MAG P / 317.2/01		

Test conditions: *Un: 230V* *Fn: 50Hz*
Ib/In: 5A *PF: Cos. $\phi = 1.0$*

Test Circuit: *3 phase 4 wire*

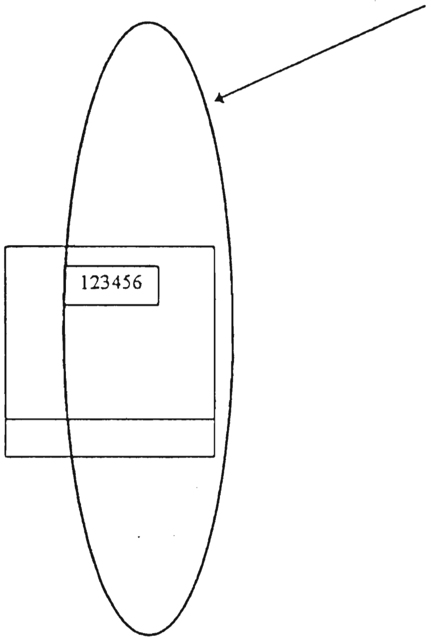
Measurement mode - Active Import Energy kWh

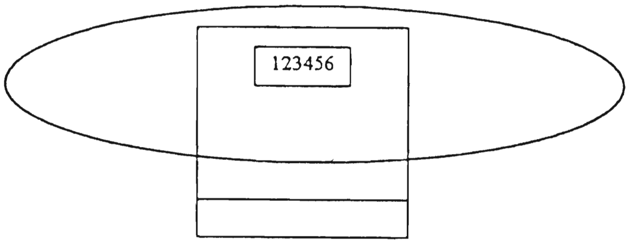
		Limit of % Error Variation	
Electromagnetic Position	*% Error*	Accuracy	
		Class 1	Class 2
No field applied	*-0.07*	-	-
Left side of meter	*-0.12*	±2.0	±3.0
Front of meter	*-0.12*	±2.0	±3.0
Right side of meter	*-0.08*	±2.0	±3.0
Top of meter	*-0.09*	±2.0	±3.0

2.5.8 Magnetic Induction of External origin 0.5mT X-Ref. 4.6.2

Ac magnetic induction of external origin, produced by a coil of one metre diameter, field strength at its centre 0.5mT (400 Ampere turns).

The magnetic field's orientation with respect to the meter under test.

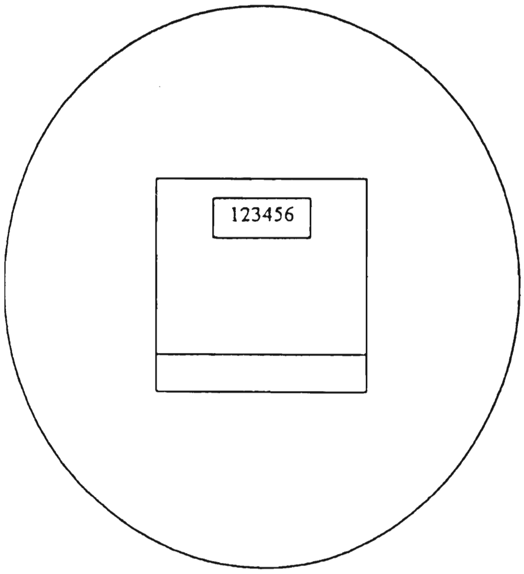




Magnetic Field Orientation Y - Y

Magnetic Field Orientation X - X

Magnetic Field Orientation Z - Z



Test Results ID / Sample No. A317 AC MAG + P / A109800124	Test Procedure :	T/T +P X-X FAIRY RING T/T +P Y-Y FAIRY RING T/T +P Z-Z FAIRY RING TP010

Test conditions:	*Un: 230V* *Ib/In: 5A*	*Fn: 50Hz* *PF: Cos. $\phi = 1.0$*
Test Circuit:	*3 phase 4 wire*	

Measurement mode - Active Import Energy kWh

Phase angle of the field with respect to U3 (Vph)	Direction of field orientation		
	X - X	Y - Y	Z - Z
	% Error	*% Error*	% Error
No Field Applied			
0°	*+0.18*	*+0.14*	*+0.16*
30°	*+0.11*	*+0.17*	*+0.12*
60°	*+0.13*	*+0.09*	*+0.21*
90°	*+0.22*	*+0.01*	*+0.31*
120°	*+0.22*	*-0.07*	*+0.30*
150°	*+0.18*	*-0.06*	*+0.27*
180°	*+0.19*	*+0.02*	*+0.25*
210°	*+0.20*	*+0.08*	*+0.20*
240°	*+0.14*	*+0.16*	*+0.07*
270°	*+0.09*	*+0.27*	*+0.01*
300°	*+0.10*	*+0.36*	*+0.01*
330°	*+0.12*	*+0.31*	*+0.02*
360°	*+0.07*	*+0.26*	*+0.03*
	+0.09	*+0.20*	*+0.13*

Limit of % Error Variation for	Class 1 ± 2.0%. Class 2 ± 3.0%.

Magnetic Induction of External origin 0.5mT cont. X-Ref. 4.6.2

Test Results ID / Sample No. A317 AC MAG + Q / A109800124	Test Procedure :	T/T +Q X-X FAIRY RING T/T +Q Y-Y FAIRY RING T/T +Q Z-Z FAIRY RING TP010

Test conditions:	*Un: 230V* *Ib/In: 5A*	*Fn: 50Hz* *PF: Sin ϕ = 1.0*
Test Circuit:	*3 phase 4 wire*	

Measurement mode - Reactive Import Energy kvarh

Phase angle of the field with respect to U3 (Vph)	Direction of field orientation		
	X - X	Y - Y	Z - Z
	% Error	*% Error*	% Error
No Field Applied			
0°	*+0.05*	*+0.01*	*+0.01*
30°	*-0.01*	*+0.20*	*-0.12*
60°	*-0.03*	*+0.21*	*-0.12*
90°	*-0.03*	*+0.14*	*-0.08*
120°	*-0.01*	*+0.05*	*+0.00*
150°	*+0.01*	*-0.05*	*+0.09*
180°	*+0.03*	*-0.14*	*+0.14*
210°	*+0.06*	*-0.18*	*+0.17*
240°	*+0.09*	*-0.18*	*+0.17*
270°	*+0.06*	*-0.12*	*+0.11*
300°	*+0.03*	*-0.05*	*+0.02*
330°	*+0.02*	*+0.05*	*-0.05*
360°	*+0.00*	*+0.14*	*-0.09*
	-0.03	*+0.20*	*-0.14*

Limit of % Error Variation for Class 2 & 3 ± 3.0%.

2.6 Accuracy test in the Presence of Harmonics

2.6.1 Harmonic Components in the Current and Voltage Circuits X-Ref. 4.6.2

Test Results ID / Sample No.	Test Procedure :	T/T HARMONICS TESTS
A317.2 HARMONICS / 317.2 / 01		

Test conditions: *Un: 230V* *Fn: 50Hz* *PF: Cos. $\phi = 1.0$*
Ib/In: 5A *Im: 120A*

Fundamental frequency current: $I_0 = 0.5$ Imax
Fundamental frequency voltage: $U_0 = Un$
content of 5th harmonic current: $I_5 = 40\%$ of I_0
content of 5th harmonic voltage: $U_5 = 10\%$ of Un

Resulting harmonic power due to the 5th harmonic presence: $P_{resultant} = 1.04\ P_0$

Test Circuit: *3 phase 4 wire*

Measurement mode - Active Energy kWh

		Limit of % Error Variation	
Waveform	*% Error*	Accuracy	
		Class 1	Class 2
Fundamental Only (P_0) 0.5 Imax	*+0.16*	-	-
Fundamental + 5th Harmonic ($P_{resultant} = 1.04\ P_0$)	*+0.13*	±0.8	±1.0

2.6.2 Influence of Odd and Sub Harmonics in the AC Current Circuit X-Ref. 4.6.2

Test Results ID / Sample No.	Test Procedure :	T/T HARMONICS TESTS

Test conditions: *Un:* *Fn: 50Hz* *PF: Cos. $\phi = 1.0$*
Ib/In:

Reference current waveform: $I_{ref} = 0.5$ Ib or 0.5In
Reference voltage: U = Un
Test current Phase-fired waveform: $I_{test} = \sqrt{2} \cdot I_{ref}$
Firing points = 5ms and 15ms ± 1ms
Test current Burst fired waveform: $I_{test} = 2 \cdot I_{ref}$
Distortion factor on the voltage waveform : < 0.5 % THD

Test Circuit: *1 phase 2 wire, 3 phase 3 wire, 3 phase 4 wire*

Measurement mode - Active Energy kWh

		Limit of % Error Variation	
Waveform	*% Error*	Accuracy	
		Class 1	Class 2
Fundamental Only 0.5 Ib / In	*+0.20*	-	-
Waveform Phase-fired Test current	*+0.55*	±3.0	±6.0
Waveform Burst fired Test current	*+0.26*	±3.0	±6.0

3 ELECTRICAL REQUIREMENTS X-Ref. 5.4

3.1 Power Consumption X-Ref. 5.4.1

Test Results ID / Sample No.	Test Procedure :	TP012
SAMPLE NO A109800123		

	Volts/V	Amps/A	VA	Watts/W
Wiring Configuration: Three Phase Four Wire				
Voltage Circuit: L1	*230*	*23.0mA*	*5.29*	*1.15*
Voltage Circuit: L2	*230*	*22.6mA*	*5.20*	*1.10*
Voltage Circuit: L3	*230*	*22.8mA*	*5.24*	*1.10*
Wiring Configuration: Single Phase Two Wire				
Voltage Circuit: L1	*230*	*23.0mA*	*5.29*	*1.10*
Voltage Circuit: L2	*230*	*22.7mA*	*5.22*	*1.10*
Voltage Circuit: L3	*230*	*23.0mA*	*5.29*	*1.10*
Current Circuit: L1	*2.4mV*	*5A*	*0.01*	-
Current Circuit: L2	*2.4mV*	*5A*	*0.01*	-
Current Circuit: L3	*2.4mV*	*5A*	*0.01*	-
Current Circuit: L1	*0.003V*	*10A*	*0.03*	-
Current Circuit: L2	*0.006V*	*10A*	*0.06*	-
Current Circuit: L3	*0.004V*	*10A*	*0.04*	-
Current Circuit: L1	*0.007V*	*20A*	*0.14*	-
Current Circuit: L2	*0.011V*	*20A*	*0.22*	-
Current Circuit: L3	*0.008V*	*20A*	*0.16*	-

Power consumption limits shall not exceed the following

Voltage Circuits	Single Phase		Two Element		Three Element	
Basic Meter	2W	10VA	2W	10VA	2W	10VA
multi-energy meter	3W	15VA	2.5W	12.5VA	2W	10VA
Multi-function meter	5W	25VA	3.5W	17.5VA	3W	15VA

Current Circuits 4.0VA & 2.5VA for Class 1 & Class 2 respectively

3.2 Influence of Supply Voltage

X-Ref. 5.4.2
X-Ref. 4.4.2.2

VOLTAGE DIPS AND INTERRUPTIONS

Test Results ID / Sample No.	Test Procedure :	TP005
		T/T KWH TEST CRITERIA 1
01AE DIPS & INTERRUPTS / A109800123		T/T KVARH TEST CRITERIA 1

Test Circuit: *1 phase 2 wire, in the case of Polyphase meters tests were conducted on each voltage circuit in turn.*

The tests were applied under the following conditions;

- voltage and auxiliary circuits energised with reference voltage
- current circuits open.

Test a)	Voltage interruption of :	V = 100%
	Interruption time :	1s
	Number of interruptions :	3
	Restoring time between interruption :	50ms
Test b)	Voltage interruption of :	V = 100%
	Interruption time:	20ms
	Number of interruptions:	1
Test c)	Voltage depression of :	V=50%
	Depression time:	60s
	Number of depressions:	1

The application of the above tests did not produce a change in the meter registers of more than x kWh/kvarh, and the test output did not produce a signal equivalent of more than x kWh/kvarh, where x is given by

$$x = 10^{-6} \cdot \mathrm{m} \cdot \mathrm{Un} \cdot \mathrm{Imax}$$

On completion of the above tests, the meters were found to function correctly and within the accuracy specification when subsequently operated under reference operating conditions.

3.3 Test of Influence of Short-Time Over-currents X-Ref. 5.4.3

Tests conducted at an external Accredited Laboratory as given in the supporting documentation

On completion of the above tests, the meters were found to function correctly and within the accuracy specification when subsequently operated under reference operating conditions.

3.4 Test of Influence of Self Heating X-Ref. 5.4.4

X-Ref. 4.4.4

Test conditions:- The meter voltage circuits were energised at reference voltage for at least 1 hour, without any current in the current circuits, after which the meter's maximum rated current was applied and the meter error determined every 5 minutes. The test was conducted at power factors of both Cos. ϕ = 1.0 and Cos. ϕ = 0.5 ind.

Test Results ID / Sample No.	Test Procedure :	T/T 3P 4W REV1 S/H,V,Hz,A,RPS
A317.2 BASIC ACC # 1 / 317.2 / 01		

Test conditions:	*Un: 230V*	*Fn: 50Hz*
	Im: 120A	*PF: Cos. ϕ = 1.0*
Test Circuit:	*3 phase 4 wire*	

Measurement Mode Active Energy kWh

Elapsed Test time (minutes)	Un Im Cos.ϕ = 1.0 *% Error*	Un Im Cos.ϕ = 0.5 *% Error*
1	*-0.22*	*-0.53*
5	*-0.35*	*-0.66*
10	*-0.43*	*-0.70*
15	*-0.49*	*-0.64*
20	*-0.62*	*-0.66*
25	*-0.64*	*-0.54*
30	*-0.73*	*-0.67*
35	*-0.70*	*-0.55*
40	*-0.76*	*-0.63*
45	*-0.78*	*-0.51*
50	*-0.76*	*-0.54*
55	*-0.83*	*-0.60*
60	*-0.78*	*-0.56*

Limit of % Error Variation: Class 1 ±0.7% @ Cos. ϕ = 1.0 & ±1.0% @ Cos. ϕ = 0.5ind
Class 2 ±1.0% @ Cos. ϕ = 1.0 & ±1.5% @ Cos. ϕ = 0.5ind

Test of Influence of Self Heating **cont.** X-Ref. 5.4.4
X-Ref. 4.4.4

Test conditions:- The meter voltage circuits were energised at reference voltage for at least 1 hour, without any current in the current circuits, after which the meter's maximum rated current was applied and the meter error determined every 20 minutes. The test was conducted at power factors of both Sin ϕ = 1.0 and Sin ϕ = 0.5 ind.

Test Results ID / Sample No.	Test Procedure : T/T Q 3PH 4W V,Hz,W,A,S/H
A317 5165 + Q T/T/ A109800124	

Test conditions: *Un: 230V* *Fn: 50Hz*
Im: 120A *PF: Sin ϕ = 1.0*

Test Circuit: *3 phase 4 wire*

Measurement Mode Reactive Energy kvarh

Elapsed Test time (minutes)	Un Im Sin ϕ = 1.0 *% Error*	Un Im Sin ϕ = 0.5 *% Error*
2	*-0.12*	*+0.26*
20	*-0.52*	*-0.20*
40	*-0.69*	*-0.42*
60	*-0.72*	*-0.52*

Limit of % Error Variation : Class 2 ±1.0% @ Cos. ϕ = 1.0 & ±1.5% @ Cos. ϕ = 0.5ind
Class 3 ±1.5% @ Cos. ϕ = 1.0 & ±2.0% @ Cos. ϕ = 0.5ind

3.5 Test of Influence of Heating X-Ref. 5.4.5

Test Results ID / Sample No.	Test Procedure :	TP021 T/T KWH TEST CRITERIA 1 T/T KVARH TEST CRITERIA 1
A317.2 HEATING 317.2/03		

The tests were conducted with the meter cover and terminal cover in place

Test conditions: *115%Un: 264.5V* *Im:* *120A* *Fn: 50Hz*

Ambient Temperature : 40°C
Test Duration : 2 hours
Surface Temperature Rise : 13 K

Permissible temperature rise : 25K

Surface temperature of the meter was measured on the meter back, approximately 10mm above the meter terminal block.

On completion of the above tests, the meters were found to function correctly and within the accuracy specification when subsequently operated under reference operating conditions, with no signs of damage or degradation in the meter's insulation properties.

4 ELECTROMAGNETIC COMPATIBILITY (E.M.C)

4.1 Radio Interference Measurement X-Ref. 5.5.5

Tests conducted at an external Accredited Laboratory as given in the supporting documentation.

4.2 Fast Transient Burst Test X-Ref. 5.5.4

Test Results ID / Sample No. A317 # 2 T/T + P / A109800123	Test Procedure :	TP003 T/T KWH TEST CRITERIA 1 T/T KVARH TEST CRITERIA 1

Transient/Burst specification:	Pulse level severity 1kV, 2kV or 4kV Rise time 5ns Width 50ns Repetition Rate 2.5kHz & 5kHz Burst Duration 15ms Burst Period 300ms Burst Generation Asynchronous (Common mode)

The tests were conducted with the meter under test (MUT) arrange as Table Top equipment, the MUT being mounted on a wooden bench plus insulating support 0.8m above the reference ground plane.

The electrical fast transient / burst generator was bonded to the reference ground plan.

AC Mains/power cables were of 1m in length.

For power / earth lines on both single and three phase equipment for test b), direct coupling of the electrical fast transient interference signal was performed via a coupling/de-coupling network.

For I/O and communication lines with a voltage of greater than 40V, and during phantom load / accuracy influence testing of the meter as detailed in Test a), the electrical fast transient interference signal was couple to the lines via a capacitive coupling clamp, with a distance between the clamp and the MUT of 0.8m to 1m.

Fast Transient Burst Test **cont.** X-Ref. 5.5.4

Test a) The meter voltage circuits were energised at reference voltage Un, with Ib/In Cos. ϕ = 1.0 in the current circuits.

Test voltage severity level ±2kV, Repetition Rate 2.5kHz voltage and current circuits
Test voltage severity level ±1kV, Repetition Rate 2.5kHz auxiliary circuits > 40V

The test voltage was applied on the current and voltage circuits in common mode, for a test duration of 10 minutes. The fast transient burst was applied three times for 1s for each test voltage polarity, spread equally over the test duration.

Test conditions:	*Un: 230V*	*Fn: 50Hz*
	Ib/In: 5A	*PF: Cos. ϕ = 1.0*

Test Circuit: *1 phase 2 wire, all meter voltaqe / current circuits connected in parallel /series configuration.*

Measurement mode - Active Import Energy kWh

		Limit of % Error Variation	
Effect on Meter Registration	*% Error*	Accuracy	
		Class 1	Class 2
No FTB applied	*+0.1*	-	-
Application of FTB @ ±2kV (on Voltage & Current Circuits)	*-0.3*	±4.0	±6.0
Application of FTB @ ±1kV (on auxiliary circuits of > 40V)	-	±4.0	±6.0

Test b) The sample meters voltage and auxiliary circuits were energised with reference voltage Un, current circuits open.

Test voltage severity ±4kV & Repetition Rate 5kHz
Test duration 60s
The test voltage was applied on the current and voltage circuits in common mode .

The application of the burst voltage did not produce a change in the meter registers of more than 10 times x kWh/kvarh, and the test output did not produce a signal equivalent of more than 10 times x kWh/kvarh, where x is given by

$$x = 10^{-6} \cdot \mathrm{m} \cdot \mathrm{Un} \cdot \mathrm{Imax}$$

On completion of the above tests, the meters were found to function correctly and within the accuracy specification when subsequently operated under reference operating conditions, with no signs of damage or corruption to meter register data.

4.3 Immunity to Electromagnetic HF Fields X-Ref. 5.5.3

Test Results ID / Sample No.	Test Procedure :	TP001
BJ02 / A317.2/01 Mode kWh kvarh		

The effect of electromagnetic fields on the accuracy of the sample meters was carried out in a "GTEM" with a field strength of 10 V/m with 80% modulation at 1kHz sine, in the frequency range 26 MHz to 1000 MHz. The frequency of the field was increased in 1% increments from the previous test frequency. The accuracy of the meter was determined at each frequency step.

The tests were conducted as follows:-

Test 1

The meter voltage circuits were energised at reference voltage Un, with Ib/In Cos. ϕ / Sin ϕ = 1.0 respectively in the current circuits.

Tests were conducted in the four planes of axis for each wave polarisation Vertical (V1,V2,V3 & V4) and Horizontal (H1,H2,H3 & H4), with respect to the meter base.

The application of the HF field did not produce a change in the meter sample accuracy of:

Limit of % Error Variation :	Class 1	±2.0% @ Cos. $\phi = 1.0$
	Class 2	±3.0% @ Cos. $\phi = 1.0$
	Class 2 & 3	±3.0% @ Sin $\phi = 1.0$

See attached annex for Graphic representations of susceptibility test results

Test 2

The sample meters were energised with reference voltage Un, current circuits open.

The meter samples were tested with a field strength of 10 V/m with 80% modulation at 1kHz sine, in the frequency range 26 MHz to 1000 MHz. The frequency of the field was increased in 1% increments from the previous test frequency, with a dwell time at each step for a nominal 8s.

The application of the HF field did not produce a change in the meter registers of more than x kWh/kvarh, and the test output did not produce a signal equivalent of more than x kWh/kvarh, where x is given by

$$x = 10^{-6} \cdot \mathrm{m} \cdot \mathrm{Un} \cdot \mathrm{Imax}$$

4.4 Immunity to Electrostatic Discharges X-Ref. 5.5.2

Test Results ID / Sample No.	Test Procedure :	TP004
		T/T KWH TEST CRITERIA 1
AE02 / A109800123		T/T KVARH TEST CRITERIA 1

E.S.D Generator specification : Test level severity's - 8kV contact, conductive surfaces / coupling planes
15kV air gap discharge - non conducting surfaces of meter under test only.
Positive / Negative polarity
Number of discharges = 10
Rise time of discharge current <1ns
Pulse duration (50%) 30ns
Time between discharges 1s min.

The tests were conducted with the meter under test (MUT) arrange as Table Top equipment fitted with a 0.8m by 1.6m by 1mm (thickness) horizontal coupling plane, the MUT plus coupling planes being mounted on a wooden bench plus insulating support 0.8m above the reference ground plane.

The reference ground plane having dimensions of 1.8m by 2.6m by 1mm (thickness).

The reference ground plane and horizontal coupling plane were electrically connected via 470 kΩ resistors.

The MUT and all cables were isolated from the horizontal coupling plane by a 0.5mm insulating support.

The discharge return cable of the ESD generator to the ground reference plane being made via a 2m earth cable isolated from the coupling planes by at least 0.1m.

For each type of ESD application (direct, contact & indirect) there was a minimum of 1s between successive discharges.

For direct application of discharge to the MUT, only those points and surfaces of the equipment which are accessible to personnel during normal usage were exposed to ESD, i.e. push buttons, terminal / cover screws, conductive metallic cards inserted into card / token reader interfaces.

In the application of direct contact discharge to conductive surfaces of the MUT, the ESD generator was held perpendicular to the surface to which the discharge was to be applied, i.e. the discharge electrode being first made contact with the test point, then the discharge triggered.

For application of air gap discharge to non-conducting surfaces of the MUT, the triggered ESD generator was held perpendicular to the surface to which the discharge was to be applied, the discharge electrode being moved closer to the insulated test point until discharge occurred or the discharge electrode touched the MUT.

Immunity to Electrostatic Discharges (ESD) cont. X-Ref. 5.5.2

In the case of indirect application of the discharge, the horizontal coupling and the vertical coupling planes were used. Discharges were applied in each polarity to the horizontal coupling plane centrally to each side of the MUT located 0.1m for the ESD application, as well as to the central edge of the vertical plane comprising of a 0.5m by 0.5m aluminium plate, in turn positioned 0.1m from each side of the MUT. The reference ground plane and the vertical coupling plane being electrically connected via 470 kΩ resistors, insulated from the horizontal coupling plate by 0.5mm insulating support.

Discharges were applied to the coupling planes in sufficient different positions that all four faces of the MUT were completely illuminated.

The electrostatic air discharge was applied to non conductive surfaces of the MUT.

Contact and indirect electrostatic discharge were applied to coupling planes and external conductive surfaces of the meter cover/base.

The tests were conducted under the following conditions;

Test a) Meter in the non-operating condition with the voltage, current and auxiliary circuits not energised, all the voltage and auxiliary circuits were connected together, with the current circuits open.

and

Test b) The sample meter energised with reference voltage, current circuits open.

The application of the electrostatic discharge did not produce a change in the meter registers of more than x kWh/kvarh, and the test output did not produce a signal equivalent of more than x kWh/kvarh, where x is given by

$$x = 10^{-6} \cdot \mathrm{m} \cdot \mathrm{Un} \cdot \mathrm{Imax}$$

On completion of the above tests, the meter was found to function correctly and within the accuracy specification when subsequently operated under reference operating conditions.

5 CLIMATIC INFLUENCES X-Ref. 5.3

5.1 Dry Heat Test X-Ref. 5.3.1

Test Results ID / Sample No.	Test Procedure :	TP021
A317 Hot & Cold / A109800124		

The test was conducted under the following conditions;

Meter in the non-operating condition
Temperature +70°C ± 2°C
Duration of the test 72h

5.2 Cold Test X-Ref. 5.3.2

Test Results ID / Sample No.	Test Procedure :	TP021 T/T KWH TEST CRITERIA 1
A317 Hot & Cold / A109800124		T/T KVARH TEST CRITERIA 1

The test was conducted under the following conditions;

Meter in the non-operating condition
Temperature -25°C ± 3°C
Duration of the test 72h

On completion of the above tests, the meters were found to function correctly and within the accuracy specification when subsequently operated under reference operating conditions, with no signs of damage or corruption to meter register data.

5.3 Damp Heat, Cyclic Test X-Ref. 5.3.3

Tests conducted at an external Accredited Laboratory as given in the supporting documentation

On completion of the above tests, the meters were found to function correctly and within the accuracy specification when subsequently operated under reference operating conditions with no signs of damage or degradation in the meter's insulation properties.

5.4 Solar Radiation Test X-REF. 5.3.4

Meter is not intended for outside use.

6 MECHANICAL REQUIREMENTS X-Ref. 5.2

6.1 Vibration Test X-Ref. 5.2.3

Tests conducted at an external Accredited Laboratory as given in the supporting documentation

On completion of the above tests, the meters were found to function correctly and within the accuracy specification when subsequently operated under reference operating conditions.

6.2 Shock Test X-Ref. 5.2.2

Tests conducted at an external Accredited Laboratory as given in the supporting documentation

On completion of the above tests, the meters were found to function correctly and within the accuracy specification when subsequently operated under reference operating conditions.

6.3 Spring Hammer Test X-Ref. 5.2.1

Test Results ID / Sample No.	Test Procedure :	TP006
BJ04 / A317/ 01		

The test was conducted under the following conditions;

Kinetic Energy of Spring Hammer 0.2 Nm ± 0.05 Nm

The meter case and terminal cover where acted upon all external surfaces, including the display window. After the test no damage was evident and the meter continued to function correctly.

6.4 Penetration of Dust & Water X-Ref. 5.2.5

Tests conducted at an external Accredited Laboratory as given in the supporting documentation

On completion of the above tests, the meters were found to function correctly and within the accuracy specification when subsequently operated under reference operating conditions with no signs of damage or degradation in the meter's insulation properties.

6.5 Resistance to Heat & Fire X-Ref. 5.2.4

Tests conducted at an external Accredited Laboratory as given in the supporting documentation

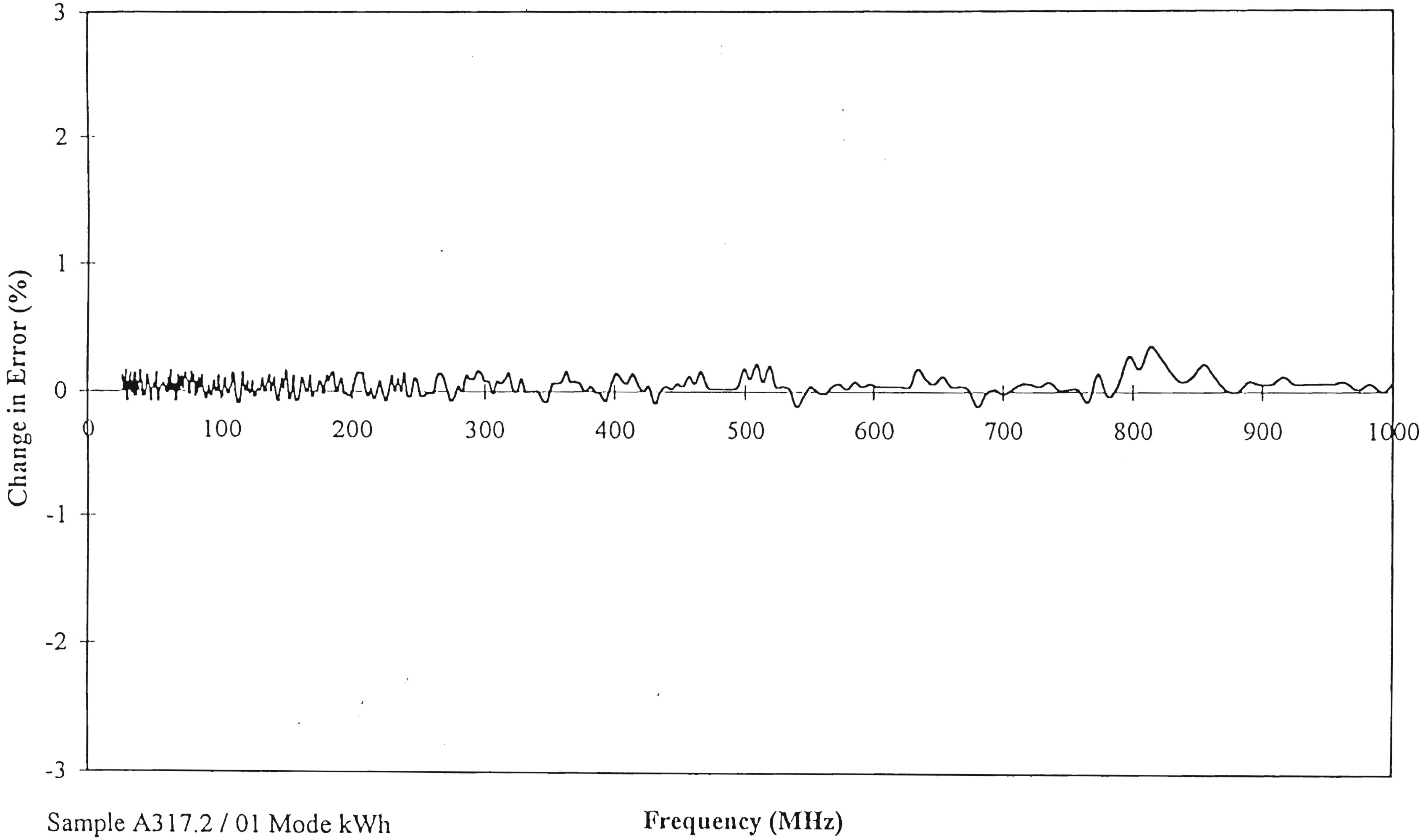
ANNEX (pages < 16 >)

Immunity to Electromagnetic HF Fields

X-Ref. 5.5.3

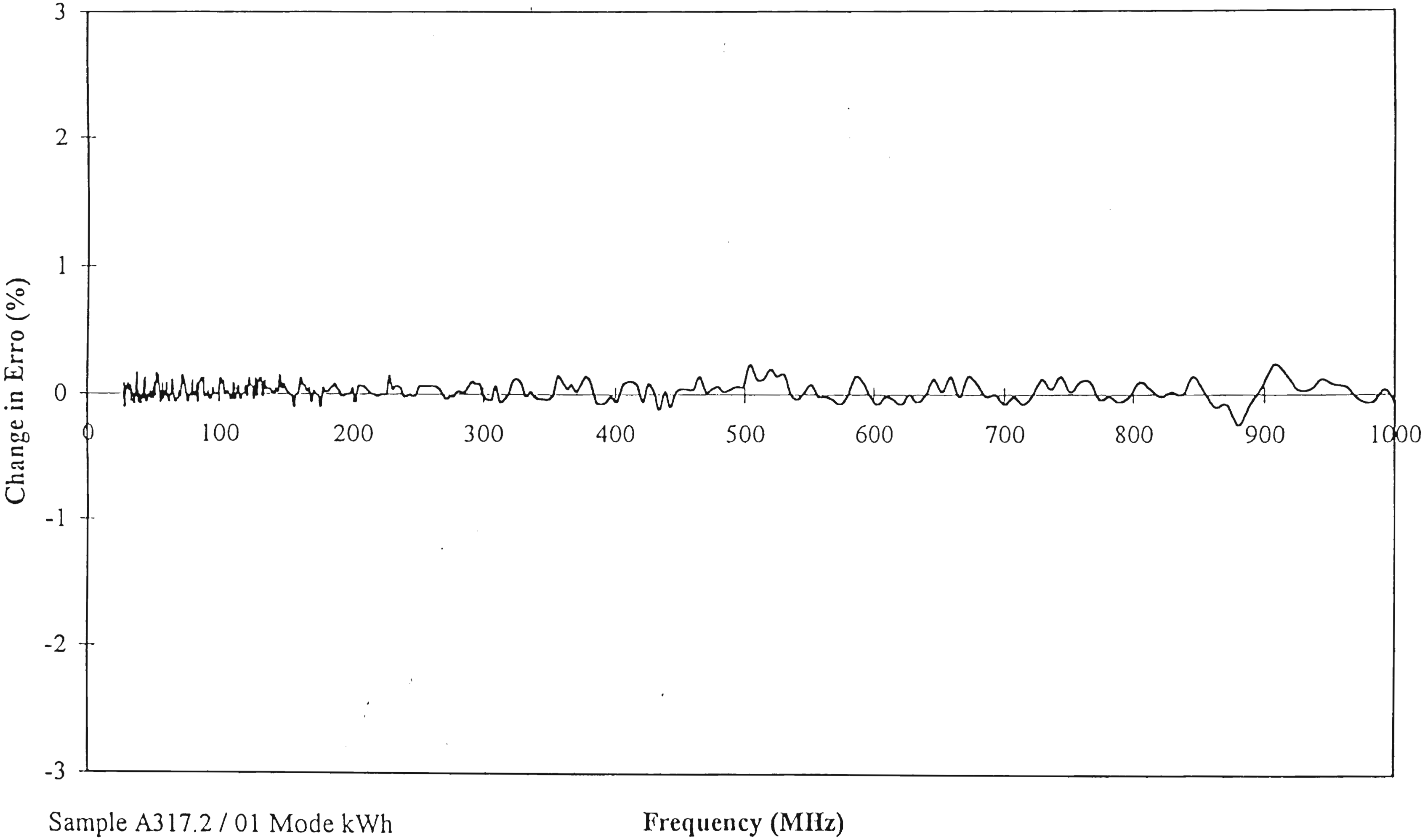
Graphic representations of susceptibility test results

RFI Immunity Plane: V1
Ampy 5165



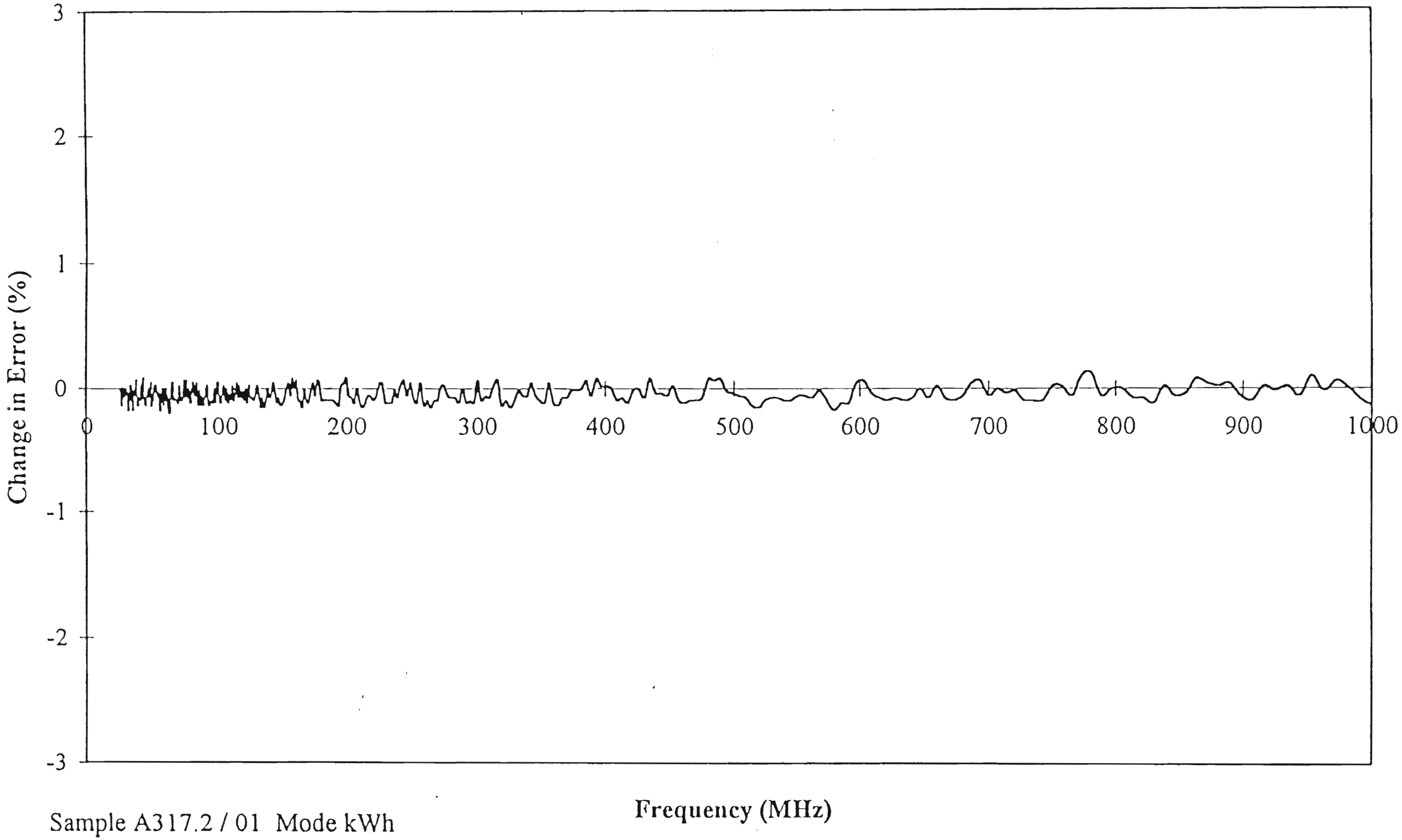
Sample A317.2 / 01 Mode kWh

RFI Immunity   Plane: V2
Ampy 5165



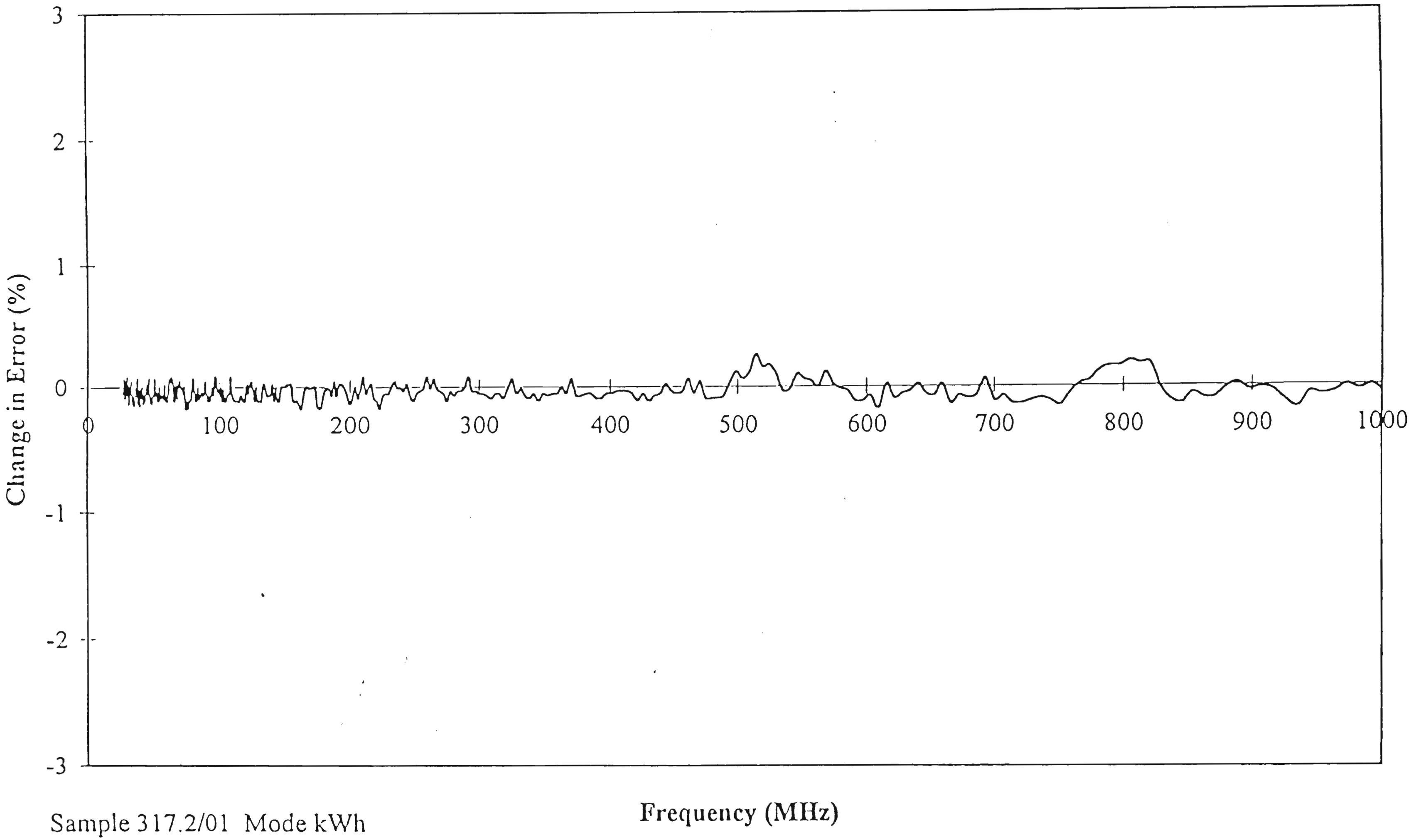
Sample A317.2 / 01 Mode kWh

RFI Immunity Plane: V3
Ampy 5165



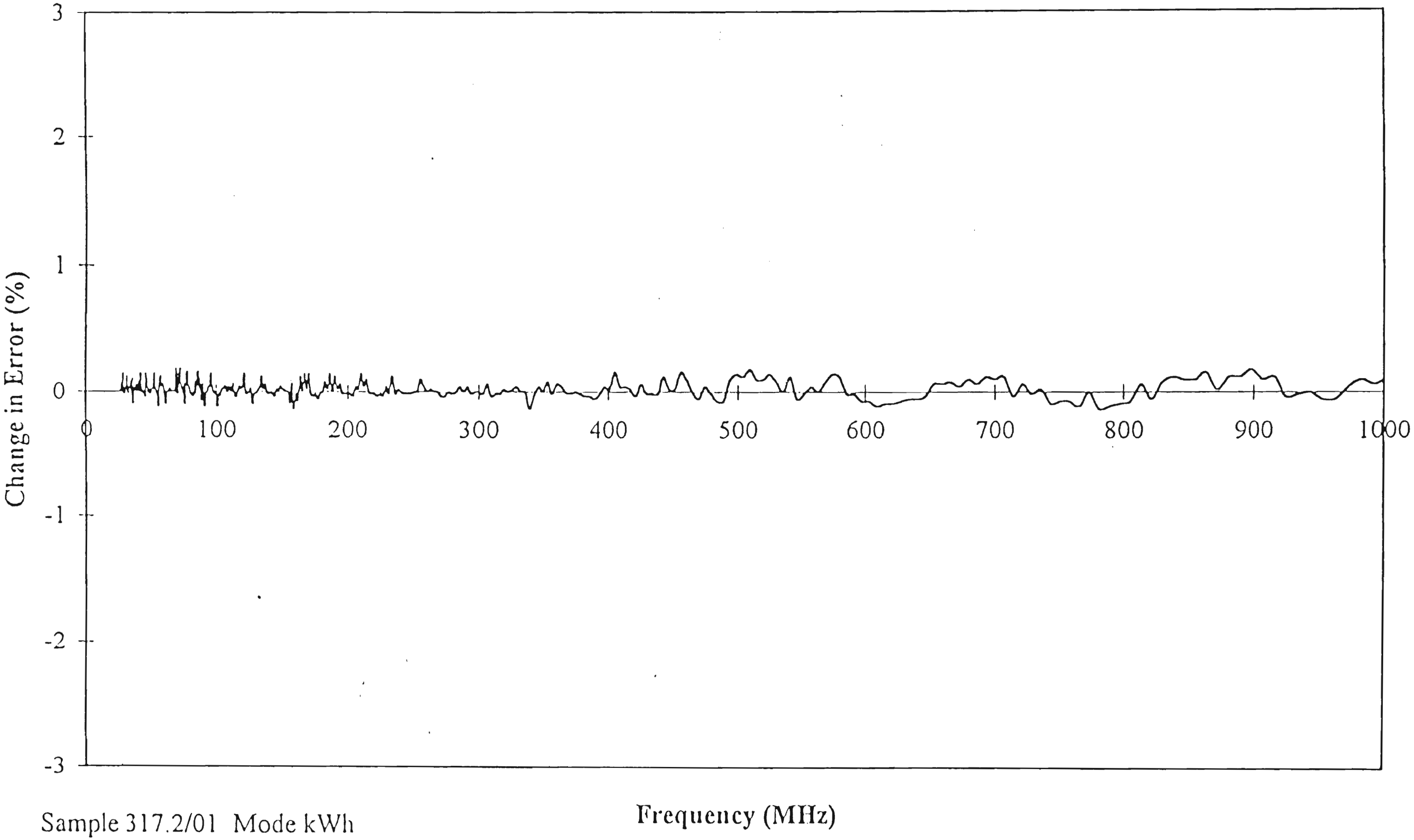
Sample A317.2 / 01 Mode kWh

RFI Immunity Plane: H1
Ampy 5165



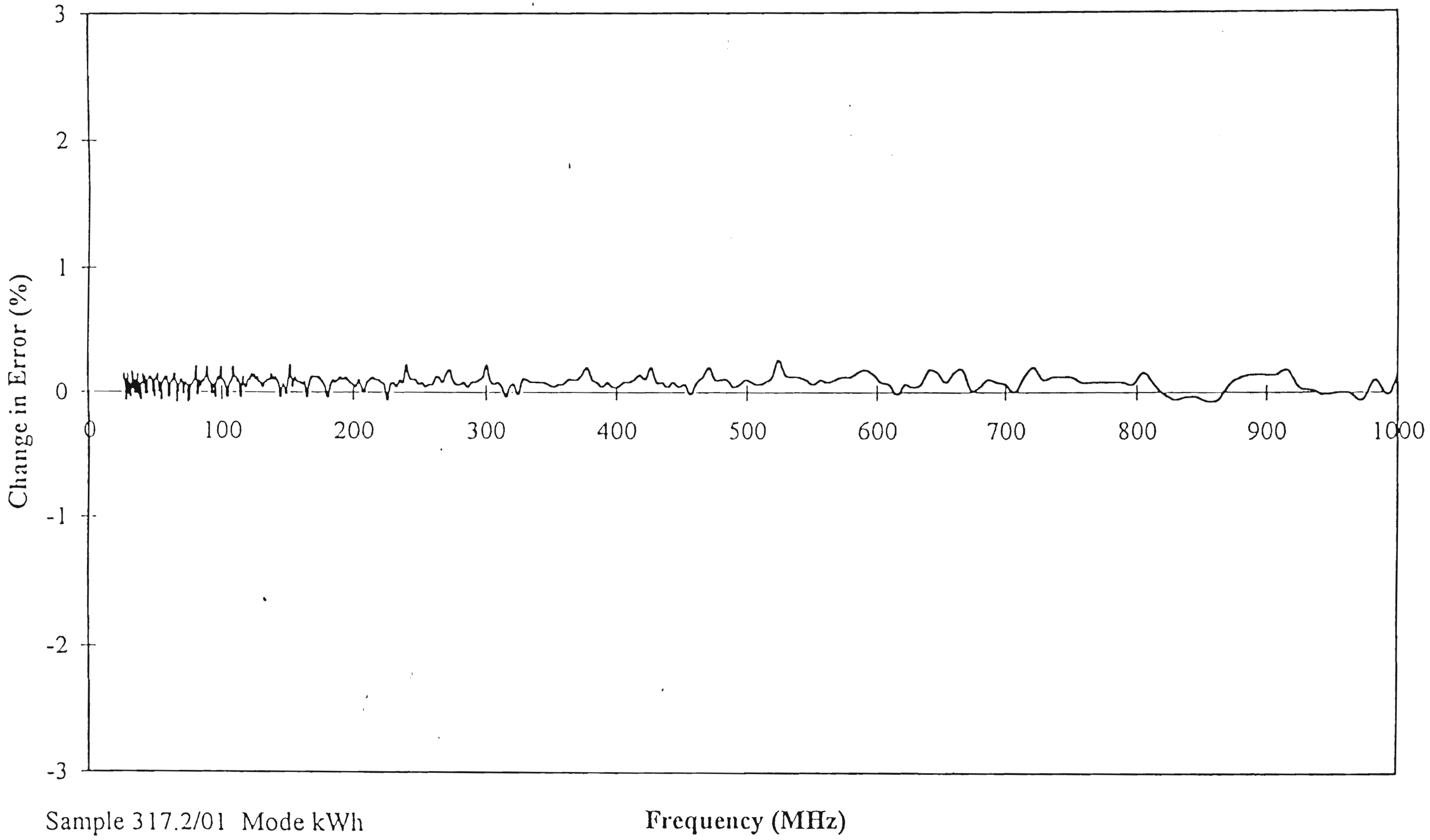
Sample 317.2/01 Mode kWh

RFI Immunity Plane: H3
Ampy 5165



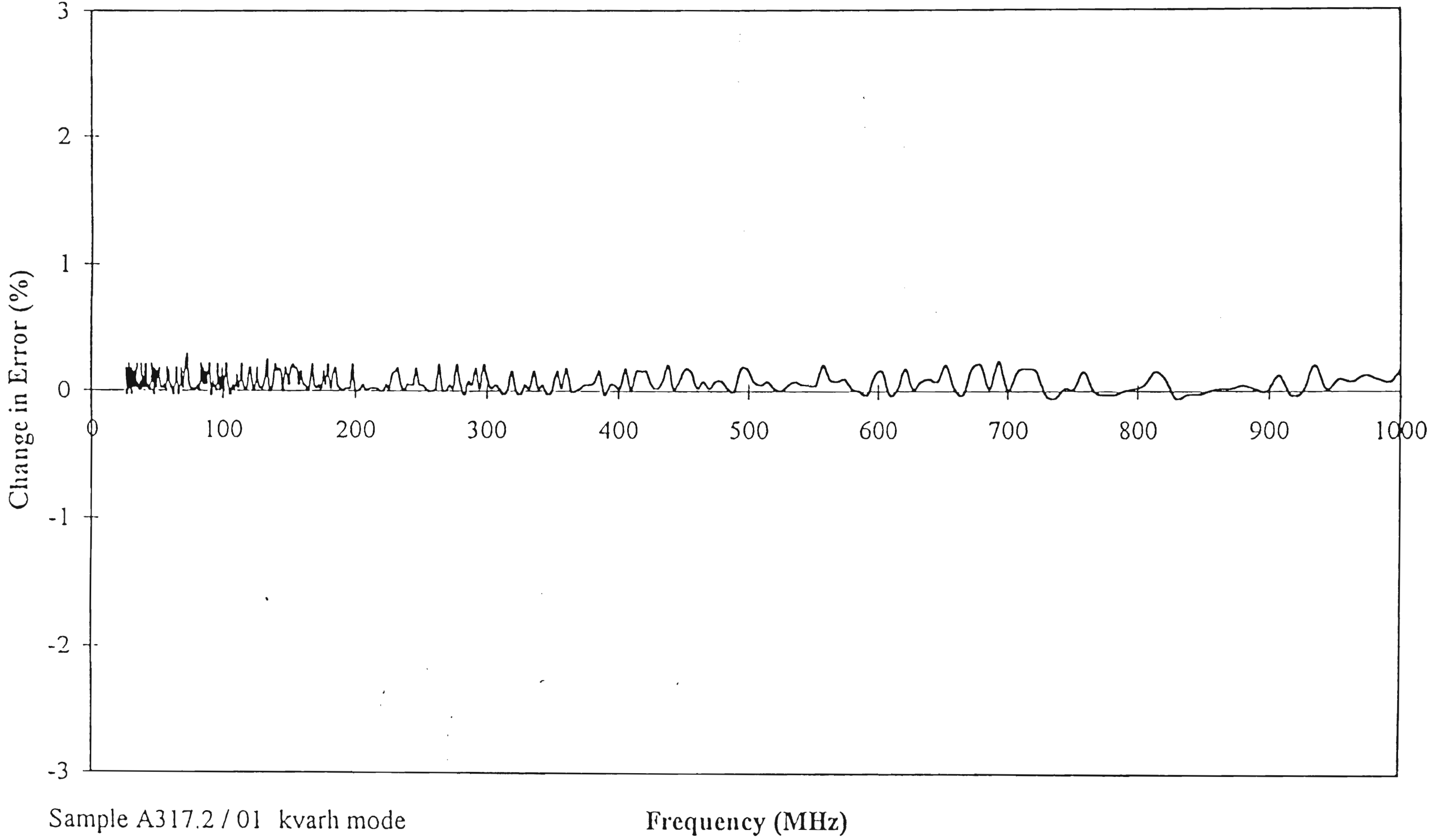
Sample 317.2/01 Mode kWh

RFI Immunity   Plane: H4
Ampy 5165



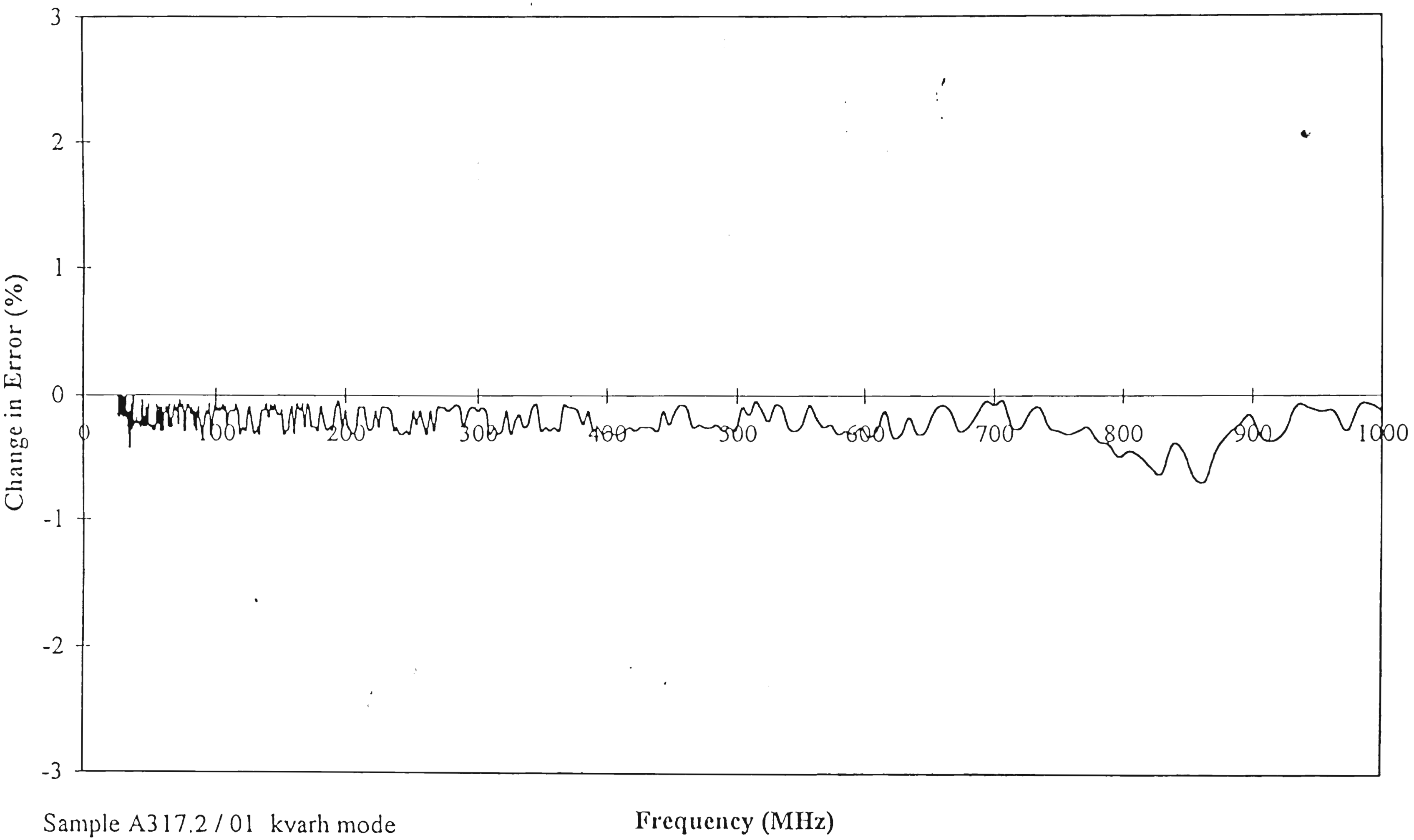
Sample 317.2/01 Mode kWh

RFI Immuniy Plane: V4
Ampy 5165



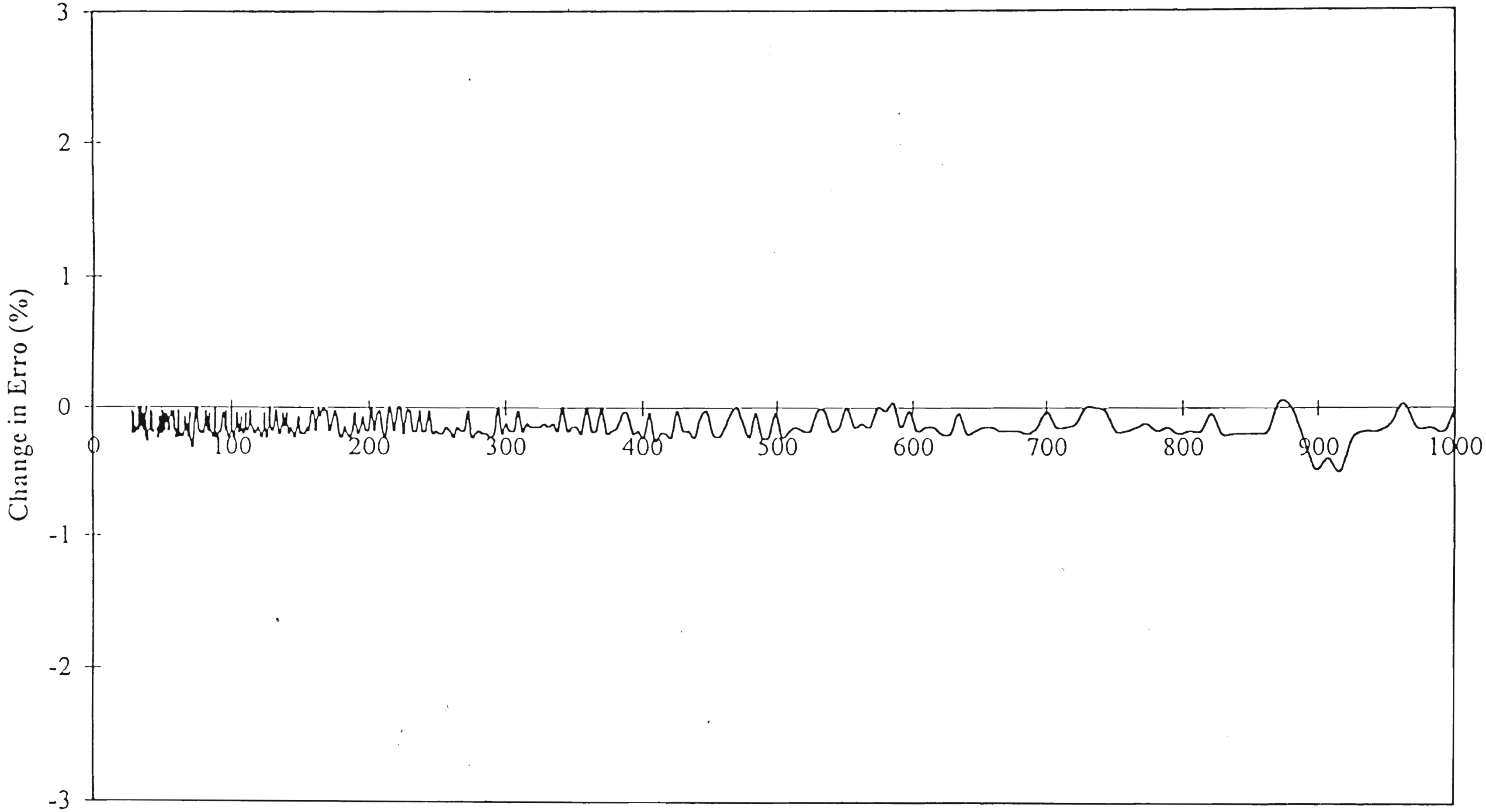
Sample A317.2 / 01 kvarh mode

RFI Immunity Plane: V1
Ampy 5165



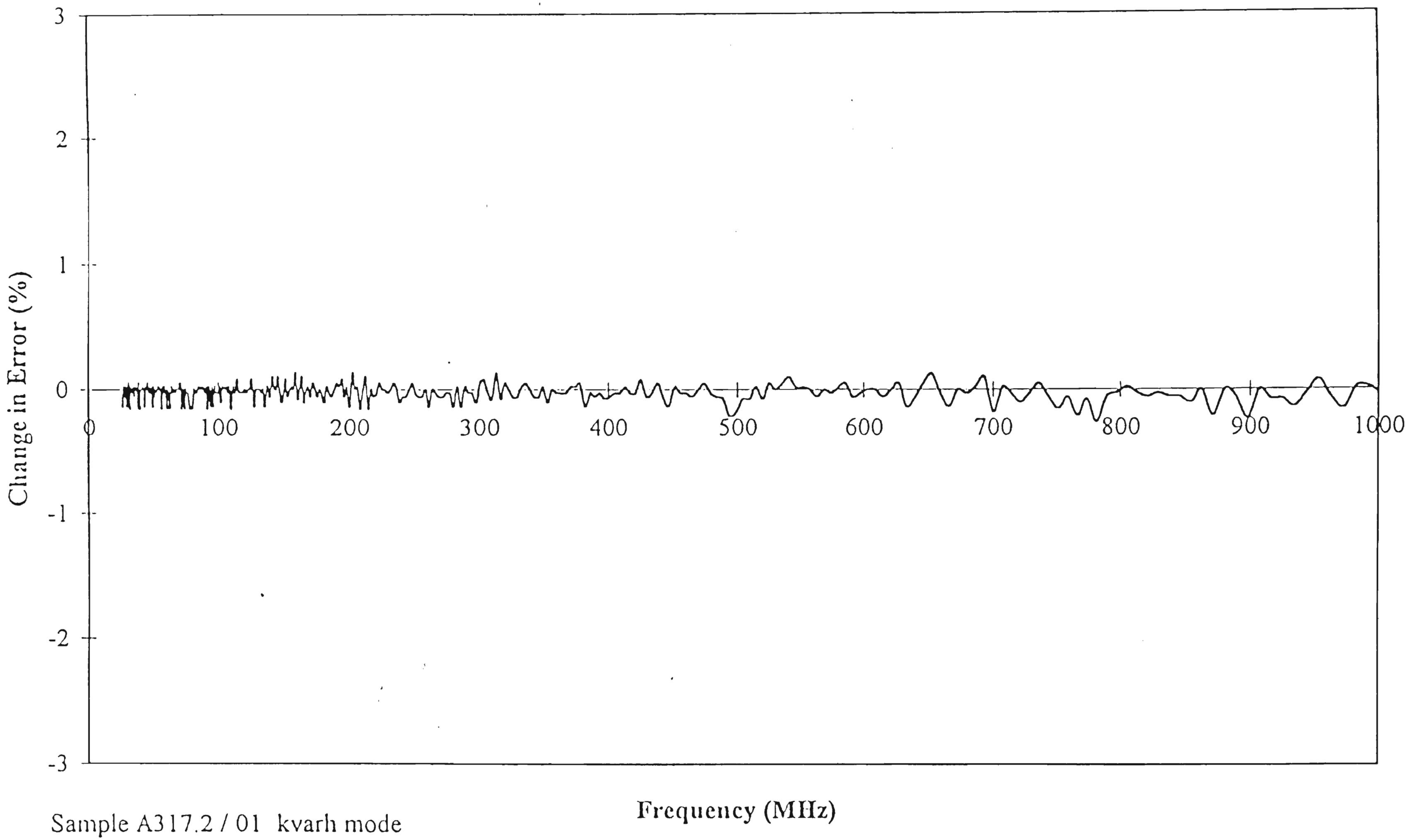
Sample A317.2 / 01 kvarh mode

RFI Immunity Plane: V2
Ampy 5165



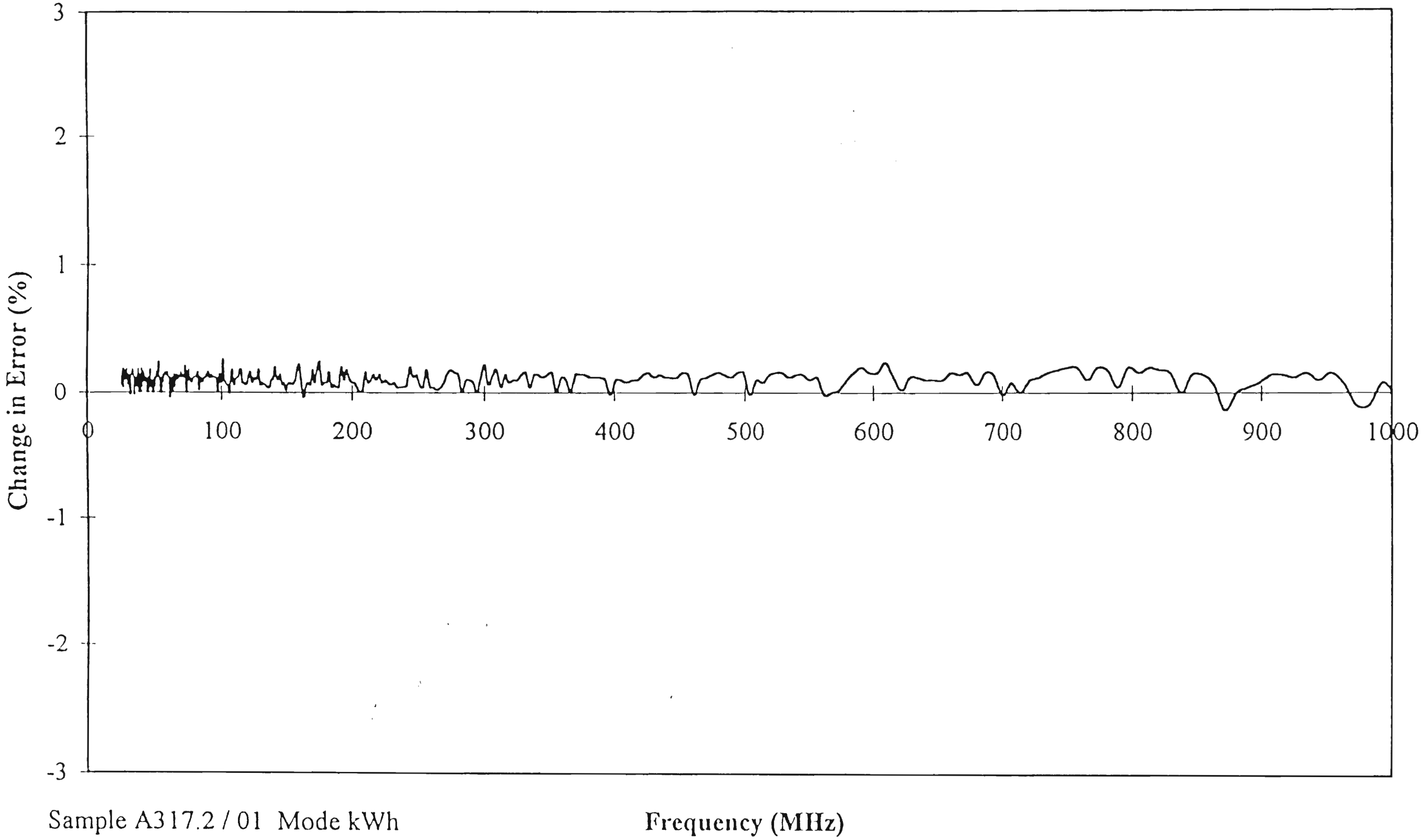
Sample A317.2 / 01 kvarh mode

RFI Immunity   Plane: V3
Ampy 5165

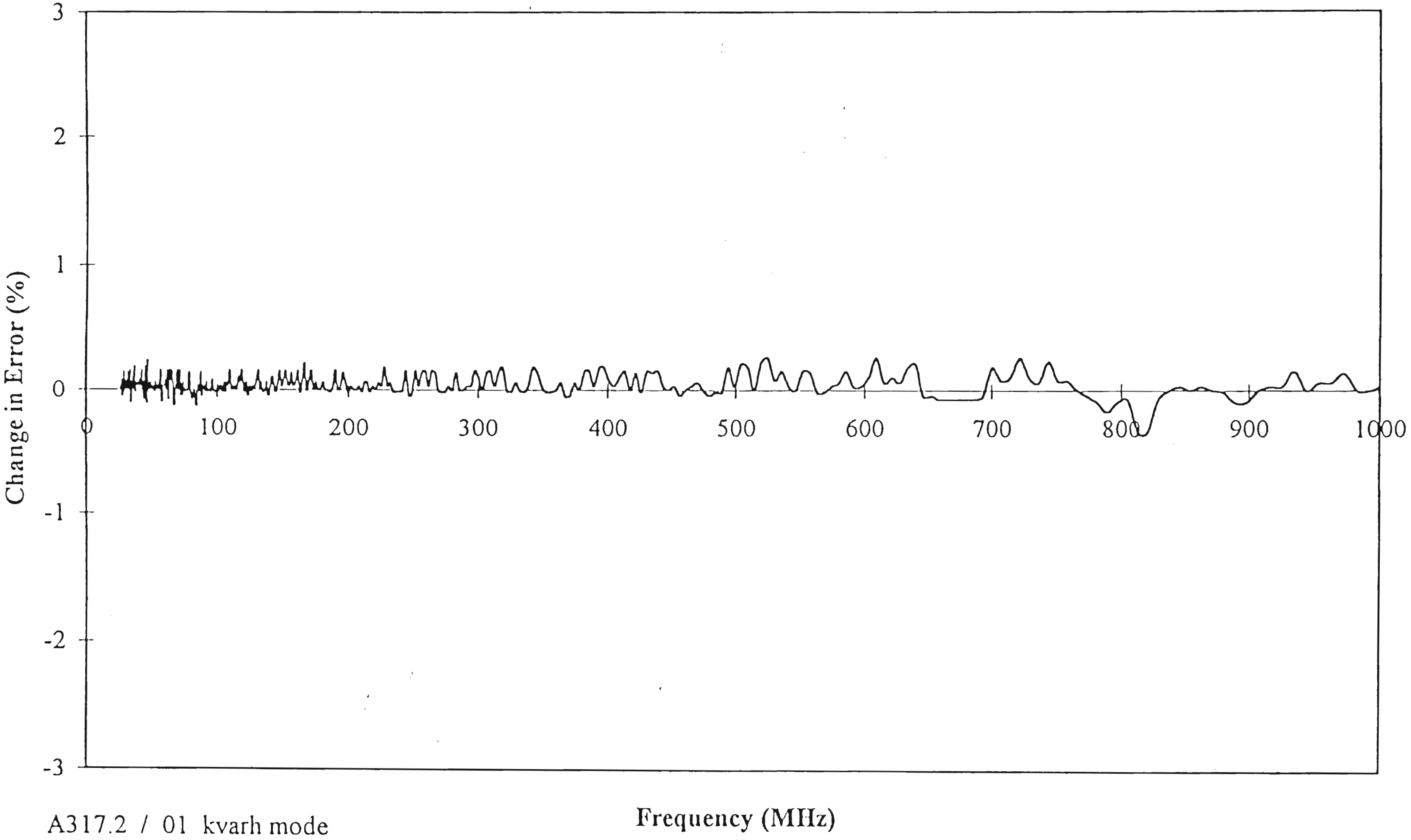


Sample A317.2 / 01 kvarh mode

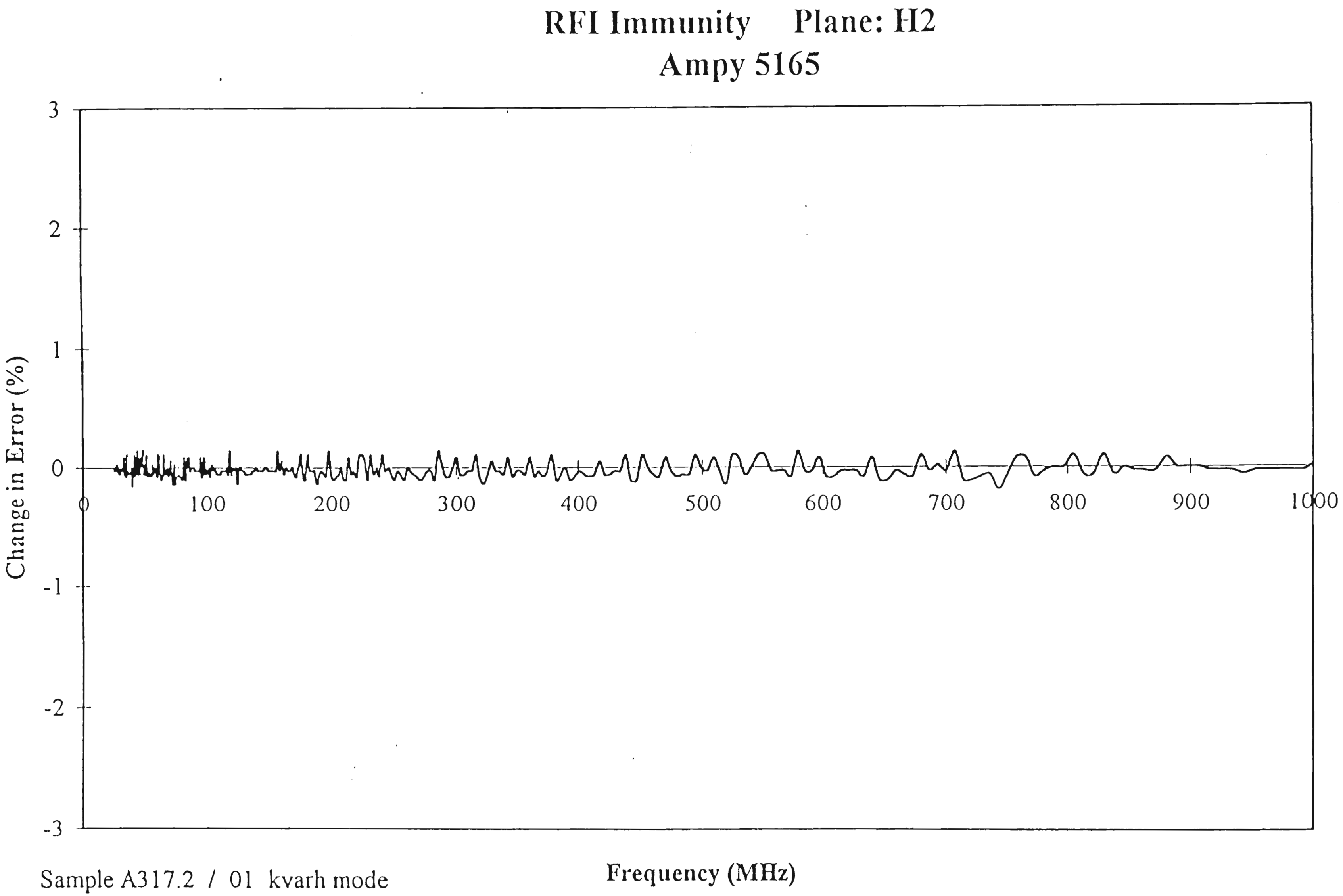
RFI Immuniy Plane: V4
Ampy 5165



RFI Immunity   Plane: H1
Ampy 5165

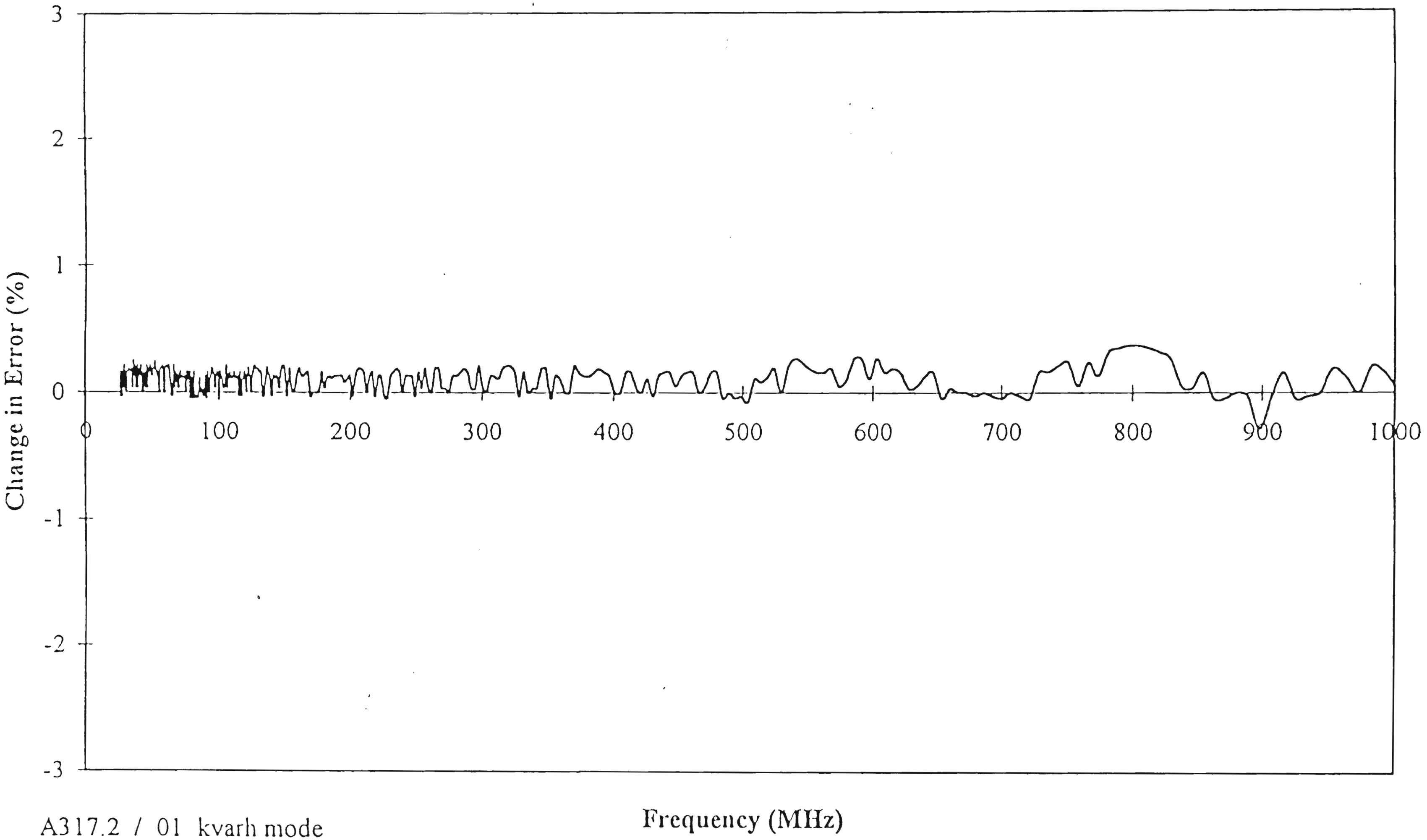


A317.2 / 01 kvarh mode



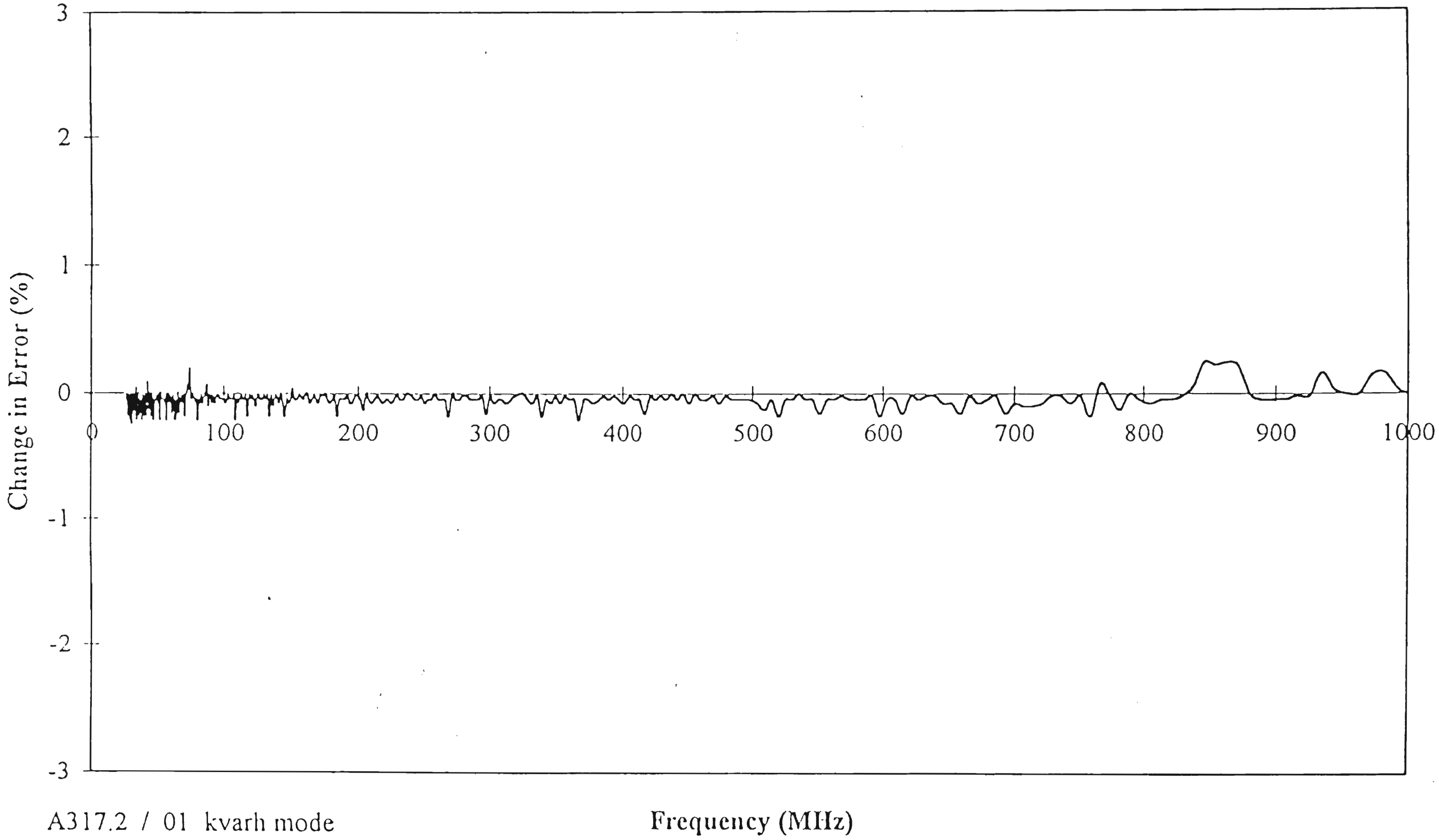
Sample A317.2 / 01 kvarh mode

RFI Immunity Plane: H3
Ampy 5165



A317.2 / 01 kvarh mode

RFI Immunity Plane: H4
Ampy 5165



A317.2 / 01 kvarh mode